Can factors in the educational environment influence cognitive appraisals of control and value in chiropractic medical students?

Thesis submitted in accordance with the requirements of the University of Liverpool for the degree Doctor of Education

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Declaration of Originality

The work contained in this thesis has not been previously submitted to meet the requirements for any other award or credit at this or any institution of higher education. To the best of my knowledge, the thesis is wholly original, and all material or writing published or written by others and contained herein has been duly referenced and credited.

Signature: 

Date: March 25, 2019

Abstract

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Michael Wiles

Pekrun and co-workers have described a theoretical construct and continuum by which elements of the educational environment are posited to influence cognitive appraisals of control (over one's academic performance) and value (of one's education). These appraisals are said to influence what Pekrun called achievement emotions, or emotions that are tied to educational outcomes. This construct suggests that educational outcomes, the worthy goal of any educational program, could be influenced at the onset by the educational environment. This would be of interest to educators in order to manipulate the environment to influence cognitive appraisals, which in turn influence achievement emotions.

Chiropractic medical students were surveyed and interviewed to assess their perceptions of the educational environment, control and value. The survey instrument consisted of the fifty questions of the Dundee Ready Educational Environment Measure, and ten questions measuring cognitive appraisal of control and value. These latter ten questions had been previously developed and used in several studies investigating appraisals of control and value . Forty-three students (67.2%) completed the survey instrument and six students were interviewed. The qualitative and quantitative data showed that cognitive appraisal of control was strongly correlated with a wide range of elements of the educational environment, in agreement with Pekrun's construct. However, the findings also showed that cognitive appraisal of value had little to no correlation with the educational environment and is possibly an intrinsic and independent characteristic of these students. These findings are of specific importance to chiropractic educators by supporting the need for a positive educational environment, and of a more general importance to health science educators by demonstrating the importance of personal and social elements in the learning process. These findings also suggest the need for further research into the nature of the perception of value in chiropractic medical students, and whether the strong correlation of the educational environment and perception of control is due to a cause-effect relationship.

Glossary of Terms

Term	Definition
Academic emotions	The subset of achievement emotions that are experienced by individuals in an academic setting
Achievement emotions	Emotions tied directly to achievement activities (e.g. studying) or outcomes (e.g. success and failure)
Cognitive appraisal of control	Perceived control over achievement, as indicated by competence perceptions and achievement expectations
Cognitive appraisal of value	Subjective value or importance of achievement
Control-value theory	A comprehensive approach to understanding emotions in education; posits that there is a linear and reciprocal relationship between the educational environment, cognitive appraisals of control and value, achievement emotions, and educational outcomes
DREEM	Dundee Ready Educational Environment Measure (a 50-item instrument primarily used to measure the medical educational environment)

Chapter 1 – Introduction to the research: context and significance

There appears to be a world-wide trend in higher education away from the traditional role of preparing students for a career of scholarship and discovery, to one that seeks to identify and meet the demands of a technologically oriented society through the preparation of students for practical careers. Barnett (2004) described this trend as the "changing face of academia", with some of those changes bringing "institutions of higher education into challenging relationships with the players in their wider environments" (Barnett, 2004, p. 71).

Within chiropractic education, this trend has led to an emphasis on the definition and achievement of practical, competency-based educational outcomes (which has been codified in recent revisions of professional accreditation standards for chiropractic education in the USA). The achievement of practical and competency-based outcomes will support the demonstration of societal relevance of chiropractic education, in keeping with Barnett's proposition. It follows that it is important for chiropractic educators to demonstrate effectiveness in achieving and measuring educational outcomes (Ebrall, Draper, & Repka, 2008). Understanding the precedents of positive educational outcomes would help chiropractic educators to pro-actively design programs to improve their effectiveness.

For clarity, it should be noted that chiropractic education is generally similar to allopathic education, with a focus on non-surgical and non-pharmacologic care of patients with musculoskeletal conditions, primarily back pain. Chiropractic doctors have a role analogous to Podiatric doctors in the US, with the former focusing on the spine and the latter focusing on the foot and ankle. The chiropractic training program is typically a three and a half to four year graduate level course with students admitted to the program after completing a Bachelor's degree (or in exceptional cases, after three years of a Bachelor's degree program). The list of courses taken by students at the researcher's university is provided for reference in Appendix 6.

Educational outcomes are ultimately related to the effort expended by individual students, which in turn can be influenced by their motivation to learn. There is evidence that a student's motivation to learn may be affected by emotion (McConnell & Eva, 2012), and Pekrun (2006) has studied these emotions under the moniker "achievement emotions". Finally, all of this learning activity occurs within an educational environment which can also influence the process.

The aforementioned is rather intuitive, and the relationship between the educational environment, achievement emotions (as a measure of student motivation to learn), and educational outcomes has been described by Pekrun and others as a theoretical continuum, called the control-value theory, which provides a framework for studying (educational) environmental precedents of positive achievement emotions. Specifically, the theory posits that the immediate antecedents of achievement emotions are an individual's appraisals of (1) subjective *control* of achievement activities and their outcomes, and (2) subjective *value* of the importance of achievement (Pekrun, 2006). There are a few practical studies in medical education using this framework, but none, to date, within chiropractic education. In fact, even medical education researchers have noted that "researchers outside of medical education have focused considerable effort developing theoretical models to explain the relationships between the learning environment and student outcomes" (Artino, Dong, DeZee, Gilliland, Waechter, Cruess, & Durning, 2012, pg. 1375). These authors also noted the importance of the learning environment to student learning by linking it ultimately to patient safety.

Within the medical education literature, Genn (2001a, 2001b) drew attention to the importance of the learning environment as a determinant of "pre-eminent, salient significance" (pg. 342) of behavior in an elaborate two part "unifying perspective" of the curriculum, environment, climate, quality and change in medical education (Genn, 2001a, pg. 337). Genn

(2001b, pg. 445) emphasizes this point in the second part of his extensive review by quoting Malcolm Knowles, stating that "it seems tragic…that so little attention is paid to climate in traditional education" (Knowles, 1984, pg. 14).

If a relationship can be demonstrated between factors in the educational environment and students' appraisals of control and value, then it would be reasonable to consider further studies to determine if manipulation of the educational environment could be used to enhance these appraisals (leading to positive achievement emotions and educational outcomes).

The Dundee Ready Educational Environment Measure (DREEM) is a widely used and validated instrument for measuring five domains of the educational environment. The use of DREEM in chiropractic education has been very limited, and one of only four such studies (Palmgren & Chandratilake, 2011) recommended the use of a mixed methods methodology, which is employed in this current research. Two previously used and validated instruments measuring cognitive appraisals of control and value were used along with the DREEM to create a 60-item survey, and six students were interviewed to gather qualitative data.

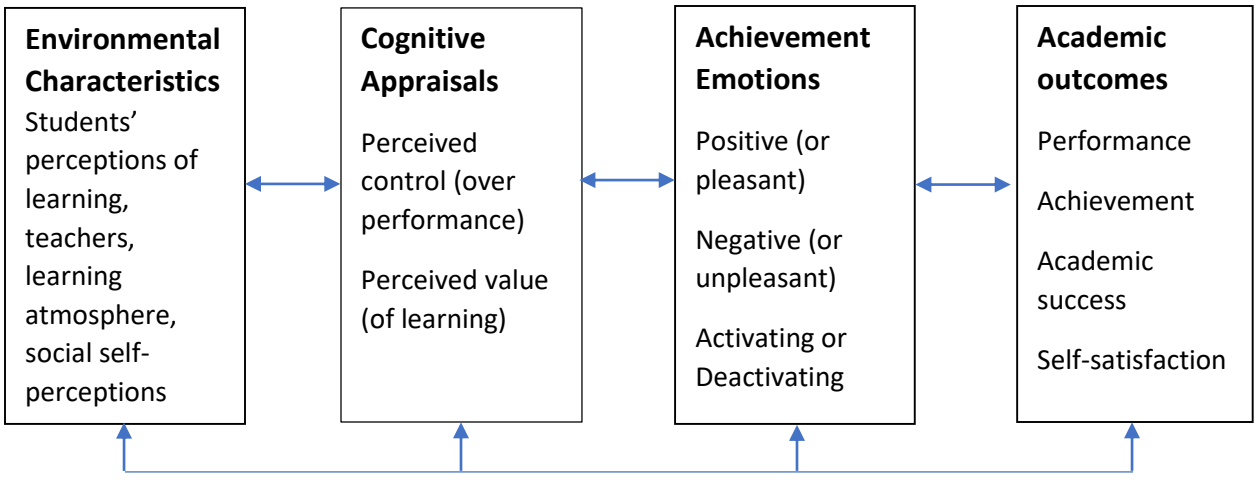
As Artino, Holmboe and Durning (2012a, pg. e158) stated, "Of particular importance is the notion that instructors can and should create learning environments that foster a high degree of control and value for students". Elucidation of this relationship in a population of chiropractic medical students is the subject of the research problem.

Chapter 2 – Literature Review

2.0 Introduction

In 2006, Reinhard Pekrun described a theoretical model that linked elements from the educational environment to academic performance outcomes, which had implications for educational research and practice (Pekrun, 2006). The major contribution of Pekrun's work is the identification of cognitive appraisals of control and value, which mediate between the educational environment and the emotions experienced by students which can facilitate or inhibit learning. This control-value theory (sometimes referred to as the control-value theory of achievement emotions) has received considerable attention since that time, including recently among medical educators (Artino, Holmboe, & Durning, 2012a; Artino, Holmboe, & Durning, 2012b; Artino & Pekrun, 2014; Duffy, Lajoie, Pekrun, & Lachapelle, 2018). Typically, the model is graphically illustrated as four sequential and inter-related elements, as in Figure 2-1. Each of these individual elements is described in this literature review, in context of the educational process, and in the context (when literature is available) of the control-value theory. Also, the inter-relationships of these four elements are described likewise, in the context of the educational process, and, when literature is available, in the context of the control-value theory.

Figure 2-1 – Components of the Control-Value Theory



2.1 Theoretical Framework

Emotions, except for test anxiety (Pekrun, Goetz, Titz & Perry, 2002) have tended to be neglected in educational psychology, although in recent years, they have been mentioned as important mediators of clinical learning in medical education (McConnell & Eva, 2012). In 1992, Reinhard Pekrun described a model linking emotions with learning and achievement (Pekrun, 1992; also, in Pekrun, 2006; and Artino & Pekrun, 2014) which emerged from his previous work on test anxiety. In this appraisal theoretical approach, the so-called control-value theory, it is posited that the learning environment influences students' appraisals of their control of the learning process and the value they place on achievement, as precedents of the emotional states that increase or decrease the likelihood of desired educational outcomes. In the theoretical construct, control refers to the perceived ability to personally influence the learning process and its outcomes. Artino, Holmboe and Durning (2012a) describe control appraisals as "often indicated by expectations and competence perceptions…such as self-concepts of ability" (p. e150), which has important implications for clinical education.

Value refers to the perception of significance or importance to an educational outcome. Specifically, the theory suggests that the cognitive appraisals of control and value are "of primary importance for the instigation of achievement emotions" with respect to learning (Frenzel, Pekrun, & Goetz, 2007a, p. 499).

The control-value theory describes a sequence or continuum of posited relationships (Figure 2-1) beginning with the educational environment which influences the student's cognitive appraisals of control and value; these cognitive appraisals then influence the so-called achievement emotions, which finally influence the educational and performance outcomes (Artino & Pekrun, 2014). Pekrun and his co-workers consider this an integrative approach to

emotions in education because the relationships posited in Figure 2-1 are based on "the premise that current approaches to achievement emotions share a number of common basic assumptions" (Pekrun, Frenzel, Goetz, & Perry, 2007, p. 14). Accordingly, the control-value theory integrates and builds upon assumptions from expectancy-value theories of emotions, transactional theories of stress appraisals, theories of perceived control, attributional theories of achievement emotions, and models addressing the effects of emotions on learning and performance ((Pekrun, Frenzel, Goetz, & Perry, 2007). Pekrun (2006) has published a review of the assumptions of the control-value theory and the considerable research providing supportive evidence for these assumptions. These assumptions include the existence of achievement emotions (emotions tied directly to achievement activities or outcomes) and the nature of cognitive appraisals of control and value as antecedents to achievement emotions. Additionally, cognitive appraisals of control and values were assumed to be related to situation-outcome expectancies, action-control expectancies, action-outcome expectancies, total outcome expectancies, causal attributions of outcomes, and values of actions and outcomes.

2.1.1. Achievement emotions.

Achievement emotions and their relationship to cognitive-appraisals and academic achievement have been studied to varying degrees. For example, Pekrun, Goetz, Daniels, Stupnisky and Perry (2010) studied the "neglected" emotion of boredom, including its effect on performance and the antecedent effects of control and value on boredom. Interestingly, Pekrun, Goetz, Hall, and Perry (2014) advanced this work by demonstrating a reciprocal relationship between boredom and academic achievement, which appears to support the assertion of Pekrun's theory that includes reciprocal linkages between the four elements of the control-value theory.

There have also been studies relating achievement emotions and academic outcomes

(Villavicencio, 2011); achievement emotions and learning strategies (King & Areepattamannil, 2014); and, the cognitive appraisal of control and its relationship with achievement emotions (King & Gaerlan, 2014), but there do not appear to be any studies tracking the entire process from the learning environment to educational outcomes, despite the fact that a need for this kind of research has been identified by Pekrun himself (Pekrun, 2006, p. 334-335) as well as reviewers of the control-value theory (Artino, Holmboe & Durning, 2012a). Artino, Holmboe and Durning's review (2012a) constituted a non-critical review of the literature describing the control-value theory and its implications for medical educational practice. These authors described the importance of emotions in learning as an introduction to the components and assumptions of Pekrun's control-value theory. Their goal appears to be providing "the reader with a framework for considering emotions in medical education contexts" (p. e150). Their review appears to provide tacit support for the assumptions of the control-value theory as a foundation for research into enhancing learning in medical education, and encouragement to medical educators to consider the importance of the learning environment for its primary role in initiating the learning process according to Pekrun's model.

2.1.2. Educational environment.

While considerable emphasis has been placed on the effect of cognitive appraisals of control and value on achievement emotions (in fact, the control-value theory is sometimes referred to in the literature as the control-value of achievement emotions), there does not seem to have been the same level of interest in the effect of the educational environment, as a precursor of the cognitive appraisals (which is the subject of the current research). For example, Pekrun (2006) discusses the implications of the control-value theory and includes suggestions for increasing the cognitive appraisal of control by "raising the cognitive quality of instruction" (p.

334); and, increasing the cognitive appraisal of value through teaching methods and "shaping instructional material…(to) meet the needs of students" (p. 334). These suggestions, of course, are related to influencing the educational environment to promote the perception of control and value, and Pekrun is direct in mentioning the need to "fine-tune" (p. 335) the learning environment to meet students' capabilities and needs. Artino, Holmboe and Durning (2012a) put it this way, "Of particular importance is the notion that instructors can and should create learning environments that foster a high degree of control and value for (medical) students" (p. e158). Medical education has typically experienced a tension between behaviorist and humanistic approaches to learning. Behaviorism, which "has made (its) way into medical education" (Rostani & Khadjooi, 2010, p. 65) is built upon the basic principles of conditioning and uses feedback (typically immediate) along with reinforcements and punishments. Such "punishments" may involve humiliation of medical students (called "pimping" in the US), which has become an unfortunate and harmful tradition in medical education (Kost & Chen, 2015). Humanism, on the other hand, views learning as a personal act and "is seen as the passion that animates professionalism" (Rostani & Khadjooi, 2010, p. 66). Kost and Chen (2015) echo the words (above) of Artino, Holmboe and Durning (2012a, p. e158), by describing the need for an improved learning environment that enhances learner success, in contradistinction to a more traditional "pimping" environment.

In their study of the interaction between the educational environment and students' emotional experiences, based on the control-value theoretical framework, Frenzel, Pekrun and Goetz (2007b) bypassed the cognitive appraisal stage altogether. They looked at the relationship between the perceived learning environment and student emotions in the classroom. Even though the author of the control-value theory (Pekrun) was one of the contributors of this work,

and despite the fact that perceived control and value are central to the theoretical framework of his theory, interestingly these authors attempted to relate the learning environment to student emotions without attempting to measure the control and value components, but instead they made assumptions that certain environmental characteristics would imply control or value. Indeed, they admitted they "had assumed that highly perceived quality of instruction implies both control…and a high regard (value) of activities in that domain" (Frenzel, Pekrun & Goetz, 2007b, p. 488). The results of their study of 1623 students in grades 5-10 may be implied but not assumed to reflect a similar picture with college-level students, but nonetheless their work supported the assumption that students' emotional experiences such as anxiety, boredom and anger were influenced by the classroom environment. Not surprisingly their conclusion included a recommendation that educators address the educational environment to positively affect achievement emotions. Of note in this work is their consideration of a multilevel modeling approach to data analysis. When looking at the effect of the learning environment on students' emotions, one can either look at individual students' perception of the environment and their individually reported emotional states; or, one can look at aggregate data reflecting the learning environment (perhaps more useful for instructors) and their association with class-level emotional states. Multilevel modeling integrates analyses at both the individual and class, or group level so that both individual and aggregate predictors can be accounted for.

2.1.3. Structure of literature review.

The relevant literature can therefore be reviewed in the context of this theoretical continuum as follows: the educational environment; cognitive appraisals of control and value; achievement emotions; and, educational and performance outcomes. The review of each of these

elements includes studies that have demonstrated direct and reciprocal linkages between the various elements of the theory.

2.2 Educational Environment

The control-value theory asserts that the *first* step in this process is the influence of the educational environment on cognitive appraisals of control and value. Roff and McAleer (2001) called this the educational "climate" in their editorial which served as a general introduction to the concept of the educational environment in medical education, and to introduce the work of Genn (2001a, 2001b). It is also noted that within this editorial these authors referred to the educational environment, educational climate, and learning environment as synonyms for the same concept. Semantically it could be argued that the learning environment is a subset of the larger educational environment, but Roff and McAleer (2001) chose to consider these as equivalent terms to describe the broader academic and social environment in which teaching and learning occurred. Accordingly, these terms tend to be used generically or interchangeably in the literature describing the educational environment in medical education.

That the educational environment can influence educational outcomes appears self-evident; indeed, the UK Standing Committee on Postgraduate Medical Education stated in 1991 that "a working environment that is conducive to learning is critically important to successful training" (Roff & McAleer, 2001, p. 334). More recently, the educational environment "has been increasingly acknowledged as vital for high-quality medical education" (Schonrock-Adema, Bouwkamp-Timmer, van Hell, & Cohen-Schotanus, 2012, p. 727). This sentiment was echoed in an editorial in 2016 describing the importance of the learning environment in the clinical education of physicians (Thibault, 2016) and linking the learning environment to both physician wellness and patient safety.

2.2.1. Early work on the educational environment.

An early study into medical students' perceptions of their learning environment was published by Edwin Hutchins in 1961 (Hutchins, 1961). He adapted an earlier 300-item college characteristics instrument developed by Pace and Stern (1958) to create a 180-item Medical School Environment Index (MSEI). Using the MSEI, he charted the average scores of 1901 medical school graduates from 25 American medical schools, in 18 scales representing environmental elements, such as faculty enthusiasm, faculty supportiveness, student competition, and student social conformity. While he was able to make some general observations about the learning environment in these 25 medical schools, Hutchins foreshadowed the control-value theory by recognizing the need to consider personality characteristics of students, to "begin to approach some understanding of the complex process of interaction between the medical student and his environment" (Hutchins, 1961, p. 329). Rather than use the MSEI, Rothman and Ayoade (1970) felt that a shorter instrument would be more useful, and, starting with a 178 item Learning Environment Questionnaire (LEQ), they eventually refined their instrument to a 65-item survey that measured seven environmental domains or clusters. The refinement process consisted of two elements based on survey results from testing on 145 first-year medical students at the University of Toronto. First, items were discarded if more than 50% of responses were "true and false", that is, the mid-point of the five-point Likert-type items, or if the item responses were not obviously skewed towards one end of the scale. This was presumably to eliminate items that were either bimodal in nature or perhaps ambiguous in their meaning. Next, the remaining items were grouped, or clustered, according to an *a priori* notion that they described a meaningful dimension of the educational environment, such as faculty member enthusiasm, learning goal clarity, breadth of studies and interests of students, and student interaction. Using this *a priori*

clustering, and starting with a single item, items that highly intercorrelated with the first item were added one-by-one and the cluster's internal consistency was calculated for each item addition. When the cluster's reliability no longer increased, no further items were added. This process, originally described in 1938 (Geiss, 1938) resulted in the reduction to 65 items in seven clusters. These seven clusters were as follows: evaluative (situations that can be clearly appraised as either good or bad); academic enthusiasm (circumstances when enthusiasm about subject matter is appraised as either high or low); goal direction (where course objectives are seen as clearly defined); authoritarianism (related to the pattern of control used in making decisions that affect learning experiences); breadth of interest (describing an environment in which student interests and activities go beyond those directly related to medicine); student interaction (related to student participation or interaction, ranging from friendly cooperation to aloofness and hostility); and, intellectual maturity (describing an environment that would appeal to intellectually mature students). The authors indicated their intent to use this refined instrument on subsequent cohort of medical students but there is no indication of the results of that study.

From the college characteristics instrument adapted by Hutchins, to his MSEI, to the LEQ, was a gradual process of refinement from 300 items and 30 scales, to 180 items and 18 scales (with six general factors) to the 65-item LEQ which had seven scales, or clusters (Rothman & Ayoade, 1970). These empirically based refinements resulted in a gradual focusing of attention on key elements of the educational environment.

2.2.2. Leading up to the DREEM.

In the UK, Harden's considerable work in the field of medical education through the 1980s included a review of educational climate research studies, co-published with Genn (Genn

& Harden, 1986) that foreshadowed his later work with Roff as part of the team that would develop the Dundee Ready Educational Environment Measure (DREEM). This review emphasized the importance of understanding the educational climate to improve the quality of the educational experience for students, and the importance of the medical teacher as an action researcher in climate studies; that is, as a participant and researcher directly within the educational environment.

In reviewing the work leading up to the development of DREEM, Roff and McAleer (2001) described the learning environment as a complex academic and social phenomenon which became increasingly important to understand as medical schools realized more diverse student populations in the 1970s and 1980s. For example, the emergence of a more equitable gender balance in medical student populations highlighted the need for a better understanding of the factors leading to a positive learning environment (Roff & McAleer, 2001).

2.2.3. The learning environment in medical education.

Genn published two "medical education guides" in 2001 (Genn, 2001a; Genn, 2001b) which served to reignite interest in the phenomenon of the learning environment. His two well-referenced guides designed for medical educators emphasized the role of the learning environment as an important determinant "of pre-eminent, salient significance" (Genn, 2001a, p. 342) of the behavior of a medical school's students and teachers.

Drawing on the work of Pace, described as a "world pioneer researcher into climates in higher education" (Genn, 2001b, p. 445), Genn emphasized the importance of the learning environment, going so far as to suggest that "climate data can be the basis of determining how 'good' the medical school is" (Genn, 2001b, p. 450). Robert Pace had completed "the initial work in this area" (Rothman & Ayaode, 1970, p. 754), developing the aforementioned 300-item

College Characteristics Index (Pace & Stern, 1958), perhaps the earliest attempt at systematically learning about the educational environment in order to "know what the medical school is really like" (Genn, 2001b, p. 445).

Jamaiah (2008) in a review of the research in medical school learning environments, cited Genn (2001a, 2001b) in defining the complex phenomenon of a learning environment, also calling it climate, ethos, ambiance, and atmosphere. His review of studies culminated in a description of the development of the DREEM instrument as a "robust, culture free and renowned tool" (p. 9), and included a chart referencing the use (by 2008) of DREEM in medical schools around the world, including the UK, United Arab Emirates, Nigeria, Nepal, Trinidad, India, Canada, Saudi Arabia, Yemen, Brazil, Malaysia and Sri Lanka.

2.2.4. The learning environment and the hidden curriculum.

Pekrun (2006), in describing the control-value theory, proposed that the learning environment was a broad field including physical, social and cultural elements. Frenzel, Pekrun, and Goetz (2007b, p. 478) later described the learning environment as embodying "more than merely physical space, indeed it consists of the entire learning setting, including instructional processes, teacher-student relationships, student-student relationships and student attitudes". The medical learning environment has been described as unique among learning environments because of the challenges of the clinical teaching setting. The challenges of surviving in this "threatening environment" (Benbassat, 2013, p. 528) results in medical students taking cues from behaviors they observe, and these cues are commonly referred to as the hidden curriculum (Benbassat, 2013). This "hidden" curriculum affects both students and faculty, and by definition, it is hidden or unseen (Hafler et al., 2011). Accordingly, while the presence of such a hidden curriculum is widely acknowledged, it has not been explicitly studied insofar as the

educational environment is concerned. What can be said, however, is that the impact of the hidden curriculum may be minimized to the extent that the educational environment is optimized for student learning.

2.2.5. Further work on the educational environment.

Aghamolaei, Shirazi, Dadgaran, Shahsavari, and Ghabarnejad (2014) published the results of their qualitative research study exploring health students' expectations of the ideal educational environment. This work relied on interview data from eight students, after which the authors stated that they reached data saturation. Their findings were consistent with the broad scope of the educational environment described by Pekrun (2006) and they identified four main themes: school atmosphere, teaching, human aspects (including teachers, students and school staff), and non-human aspects (including educational equipment and physical environment).

Dyrbye et al. (2009) studied medical student burnout and they identified student satisfaction with the learning environment to be a critical factor in determining student well-being. These authors concluded that "studies determining how to create a learning environment that cultivates student well-being are needed" (Dyrbye et al., 2009, p. 274).

Goetz and associates (Goetz, Ludke, Nett, Keller, & Lipnevich, 2013) looked at teaching characteristics as mediators of students' emotions in the classroom. It is important to note that, like the previously mentioned work of Frenzel, Pekrun, and Goetz (2007b), this work studied primary and secondary students (grades 8 and 11) rather than college-level students. However, the literature on the control-value theory does not explicitly describe any concerns, limitations or prohibitions when describing the theory's use in either primary, secondary or tertiary educational settings. Indeed, several medical educators have proposed the control-value theory as a framework for improving medical education (i.e. quaternary education) (for example, Artino,

Holmboe, & Durning, 2012a). The quality of teaching is an important component of the educational environment, and Goetz et al. (2013) studied the relations between teaching characteristics and students' academic emotions. Eight teaching characteristics ("selected…from Pekrun's control-value theory and the general research on teaching quality", p. 386) and six academic emotions (enjoyment, pride, anxiety, anger, helplessness, and boredom) were each assessed with a single-item, in this study of 121 German students. These survey items were largely selected from the previous work of Pekrun (2006) and the validity of single-item measures was justified based on the work of Wanous, Reichers, and Hudy (1997). The authors noted in their discussion that the use of single-item measures was due to logistical constraints and they recommended that future research should "take this shortcoming into account by using multiple items scales" (Goetz, Ludke, Nett, Keller, & Lipnevich, 2013, p. 391). Multilevel exploratory factor analysis revealed that the eight teaching characteristics represented two factors: supportive presentation style and excessive lesson demands. Multilevel regression analysis demonstrated that excessive lesson demands were related to the negative emotions of anxiety, anger, and helplessness, findings that support the assumptions of the control-value theory.

Claassen Ens et al. (2016) examined the relationship between the educational environment (as measured by DREEM) and students' quality of life, as measured by the World Health Organization Quality of Life Assessment. Their study of 1350 Brazilian medical students showed that the educational environment was an important mediator of the quality of life of medical students. These authors used DREEM total scores (classifying student perceptions into four groups: very poor, DREEM 0-50; having many problems, DREEM 51-100, more positive than negative, DREEM 101-150; and, excellent, DREEM 151-200), as well as the five DREEM

subscales to calculate the association with the four quality of life subscales. Multinomial regression analysis revealed that the total DREEM score and all the individual DREEM subscales were associated with higher quality of life scores (all at a significance level of $p<0.001$). An important finding was that the psychological health domain subscale of the quality of life instrument (one of four subscales of this 26-item instrument) was most closely associated with DREEM scores, suggesting the importance of a positive learning environment for psychological health, as a precursor for learning (as posited by the control-value theory).

Dunham et al. (2017) studied the perceptions of the learning environment of 4262 medical students (from 23 medical schools in the US and Canada) as part of a large longitudinal learning environment study. While these authors used another instrument (Medical School Learning Environment Survey) rather than the DREEM instrument, their findings nonetheless described the importance of the learning environment in influencing the student experience, with perception of the learning environment worsening in the first three years of the program ($p<0.0001$) and showing some recovery in the fourth year of studies (after "match day", that is, when medical students are informed of their acceptance into a residency program). The largest declines were in the subscales related to work-life balance and social relationships. The authors recommended that medical schools investigate the circumstances or conditions that contributed to student perceptions of the environment, to improve the quality of the student experience.

2.2.6. Importance of assessing the evolving educational environment.

The twenty-first century is bringing dramatic changes to education, with the seemingly endless innovations in multimedia resources and the changing characteristics of learners (Matijevic, 2012). The traditional classroom environment will very likely change as a result of technology (such as with the use of virtual laboratory exercises and high-fidelity simulations that

are becoming more frequent in medical education). Additionally, the emergence of a culture of lifelong learning will require educators to be vigilant in accurately measuring their educational environment to maintain an environment conducive to positive learning outcomes. Roff et al. (1997) recognized the need for a universal instrument (that is, culture-free and adaptable to the global field of medical education) and developed and validated the Dundee Ready Educational Environment Measure, or DREEM.

2.2.7 Dundee Ready Educational Environment Measure (DREEM).

The DREEM instrument uses 50 items to measure the educational environment in five domains (perceptions of learning; perceptions of teaching; academic self-perceptions; perceptions of atmosphere; and, social self-perceptions) (Roff et al., 1997; Roff, 2005). It was developed over several years by an international team of medical educators, led by members of the Center for Medical Education at Dundee University Medical School. The initial 110-item inventory, developed at Dundee University underwent numerous iterations through administration and testing in Scotland, Argentina, Bangladesh, Ethiopia and Thailand, with groups of medical students and nursing students. The final, refined instrument with 50 items has been widely and internationally used, and is considered "a reliable, validated inventory (Roff, 2005, p. 322). In 2005, Sue Roff stated that the instrument had been translated into nine languages and had been used around the world. Indeed, a review of literature related to DREEM from 2014 to 2016 reveals its international use as shown in Table 2.1.

Table 2.1. International use of DREEM

Country	Reference(s)
Australia	Vaughan, Carter, Macfarlane & Morrison, 2014
Brazil	Enns, Perotta, Paro, Gannam, Peleias, Mayer, Santos, Menezes, Senger, Barelli, Silveira, Martins, & Tempski, 2016
Egypt	Abusaad, Mohamed, & El-Gilany, 2015
India	Bhosale, 2015; Sunkad, Javali, Shivapur, & Wantamutte, 2015
Iran	Koohpayehzadeh, Hashemi, Arabshahi, Bigdeli, Moosavi, Hatami, & Baradaran, 2014; Andalib, Malekzadeh, Agharahii, Daryabeigi, Yaghmaei, Ashrafi, Rabbani, & Rezaei, 2015; Bakhshialiabad, Bakhshi, & Hassanshahi, 2015; Farajpour, Esaashari, Hejazi, & Meshkat, 2015
Ireland	Finn, Avalos, & Dunne, 2014; Kelly, Bennett, Muijtjens, O'Flynn, & Dornan, 2015
Italy, UK, France, Belgium, and Netherlands	Luciani, van Dun, Esteves, Lunghi, Petracca, Papa, Merdy, Jakel, & Cerritelli, 2015
Malaysia	Al-Naggar, Abdulghani, Osman, Al-Kubaisy, Daher, Nor Aripin, et al., 2014
Malaysia and UK	Wong, John, Deslandes, & Hughes, 2015
Pakistan	Imran, Khalid, Haider, Jawaid, Irfan, Mahmood, IjlalHaider, & Sami-ud-din, 2015; Ahmed, Tufail, Nawaz, Sana, & Shamim, 2016
Sweden	Palmgren, Sundberg, & Laksov, 2014
USA	Pelzer, Hodgson, & Were, 2014 (study of veterinary students)

One of the Irish studies (Kelly, Bennet, Muijtjens, O'Flynn, & Dornan, 2015) is notable because these authors compared the 50-item DREEM with a new instrument that they developed with only 8 items. This new mixed methods instrument was "underpinned by a clearly conceptualized link between environment and learning as well as psychometric evidence" (p. 1027). They felt this new Manchester Clinical Placement Index (MCPI) compared favorably with DREEM in their study of 104 medical students, although the scope of the two subscale MCPI is clearly smaller than the five subscale DREEM. Their conceptualization of equivalency for the DREEM and the MCPI was based on "the widely shared assumption that communities of practice make good learning environments" (pg. 1027). This assumption appears to have led to their deductively reasoned view of the equivalency of MCPI and DREEM. Further study would seem necessary to test this assumption in other contexts within healthcare education (medical and non-medical) worldwide.

2.2.7.1. Interpretation of DREEM scores.

Despite its wide usage, there has been some discussion as to the interpretation of the data collected by the DREEM instrument. Miles and Leinster (2009) used the DREEM instrument in a unique way to compare perceptions of staff (n=73) and students (n=403) at a UK medical school. For example, to obtain staff perceptions, some of the items on the DREEM had to be altered slightly. Hence, the student item, "I am encouraged to participate in class", was modified to "the students are encouraged to participate in class" for the staff version of the instrument. They noted that the mean scores for the five subscales revealed a slightly different picture compared to looking at a more non-parametric analysis of agreement or disagreement with each item. The means for the overall DREEM scores were similar for students (141/200) and staff (144/200). The mean scores for the individual items and the five subscales, however, showed

differences in the perceptions of the staff and students. The authors followed the advice of Till (2004) to create a non-parametric paradigm based on agreement ("agree" or "slightly agree") and disagreement ("disagree" or "slightly disagree"), and the results suggesting generally close alignment of the staff and student perceptions. Where alignment was not found, it was thought to be related to the staff's lack of familiarity (with a high percentage of "unsure" responses – something that would not be revealed by looking at mean scores for each item). These authors concluded that a different instrument, more apropos to the educational environmental experience of the staff would be needed for an accurate perception by staff members. This work was followed up by Miles, Swift and Leinster (2012) in a review of the published use of DREEM (40 publications with data from 20 countries) in which they stated that its scores could be used to identify individual items of interest, or as subscales (five have been identified), or as an overall score of the educational environment. They rightly criticized the original developers of the instrument for not providing guidance as to the statistical interpretation of the scores, whether for individual items, or subscales, or for the entire survey. Moreover, they note that there has been inconsistency in the way the data have been analyzed (both parametric and non-parametric tests have been used) and interpreted. For example, the scores for subscales, each representing the sum of seven to twelve individual item scores would tend towards a normal distribution, while there may be wide variation of individual item scores within a given subscale. Complicating this is the fact that, as mentioned previously, Till (2004) reported that several items have bimodal distributions, that is high percentages of disagree and agree responses, making it difficult to interpret an overall average score. Also, comparing one medical educational environment to another by simply summating the scores of all 50 items may lead to false interpretations of the environments of these schools. For example, one school could score extremely low in two of

five domains (e.g. 1 and 2) and high in the other three (e.g. 3, 4, and 5), while another school could score extremely low in two different domains (e.g. 4 and 5) and high in the other three (e.g. 1, 2, and 3), yielding identical total DREEM scores but representing very different schools in terms of their educational environments. This would be irrespective of the curricular models or structures (e.g. "traditional", or problem-based), adding even more confusion when trying to assess or compare environments by summated scores. Miles, Swift and Leinster (2012) followed up this review with a paper proposing guidelines for the analysis and reporting of the DREEM (Swift, Miles, & Leinster, 2013). In view of the observed non-normal distributions of DREEM scores (e.g. frequently bimodal), it was proposed that, instead of a parametric method of comparing two populations, a non-parametric method should be considered; specifically, the non-parametric Wilcoxon Mann Whitney test was recommended when comparing independent samples. This is aided by considering the individual item DREEM scores in terms of non-parametric "strongly agree-agree" and "strongly disagree-disagree" pairs rather than continuous variables, although Swift, Miles and Leinster continue to recommend reporting the mean scores for each item as a way of "flagging" or alerting investigators to items with inconsistent results. This may occur when an otherwise "acceptable" mean score may mask a bimodal response or a highly negative response.

Of course, in terms of pragmatism, what is most important is that students are reporting their perception of the learning environment, and educators who use these data ultimately become arbiters of the effectiveness of the learning environment.

Vaughan, Mulcahy and McLaughlin (2014) discussed the psychometric properties of the DREEM, in the context of a study of osteopathic students. While they cited Miles, Swift and Leinster's study reviewing the adoption and use of DREEM, they did not cite the follow-up

paper by Swift, Miles and Leinster (2013), in which evidence-based guidelines were presented for the analysis and reporting of DREEM data. They (Vaughan et al.) suggested that the full 50-item DREEM is not unidimensional and accordingly they suggest that overall scores should not be used to interpret the educational environment. Their perspective seems to make good sense, in that the subscale scores are still useful, but the overall score should be interpreted with caution, at least in terms of the comparison of different programs or institutions. Despite this note of statistical caution, DREEM has also been used in recent years to evaluate the educational environment using the overall score in pharmacy (Wong et al., 2015) and veterinary schools (Pelzer, Hodgson & Werre, 2014), in addition to its wide use in medical and nursing education. Both studies of pharmacy and veterinary students reported mean scores and subscale total scores, as well as total DREEM scores, despite the published admonition to consider more appropriate statistical analysis and interpretation of the instrument. In response to calls for more robust validation of learning environment instruments, Roff and McAleer (2015) maintain their support of DREEM's robustness by stating, "surely this is what the >200 DREEM studies currently listed in SCOPUS provide, since they all report robust psychometrics" (p. 698).

2.2.7.2. DREEM scores and academic achievement.

Roff (2005) reviewed the development and usage of the DREEM instrument, reporting on a body of research relating to its use around the world. Its validity is largely based on its developmental process, involving a Delphi panel of nearly 100 health professions educators from around the world. Among the topics they discussed was the predictive value of DREEM regarding academic achievement; and, they identified two studies that purported to substantiate a predictive value of DREEM in relation to academic achievement. Specifically, Mayya and Roff (2004) and Sun (2003) demonstrated the association of higher DREEM scores with academic

achievers. Mayya and Roff (2004) found that DREEM scores were significantly higher for academic achievers (measured by GPA) in their study of 508 Indian medical students, and Sun (2003) found the same significant relationship between DREEM scores and academic achievement in 885 Chinese medical students. As the authors note, these findings suggest that those students perceiving a positive environment (i.e. conducive to learning) were more likely to be high academic achievers, consistent with the control-value theoretical construct. Conversely, and also consistent with the control-value theory is the possibility of reciprocal (or reverse) linkage between high achievement and the perception of a positive educational environment, in which those students with high achievement would be more likely to have a positive appraisal of their environment.

2.2.7.3. Varieties of usage of DREEM in medical education.

Within medical education, the DREEM instrument has been used: (a) to measure elements of the educational environment at an institution (or institutions), with or without comparison to other institutions (Hasan & Gupta, 2013; Cocksedge & Taylor, 2013; Koohpayehzadeh, et al., 2013; Aghamolaei, et al., 2014; Bhosale, 2015; Sunkad, Javali, Shivapur, & Wantamute, 2015; Imran, et al., 2015; Andalib, et al., 2015; Enns, et al., 2016); (b) to measure changes in the educational environment following curricular change (Finn, Avalos, & Dunne, 2014); (c) to compare faculty and student perceptions of the student experience, within the same environment (Miles & Leinster, 2009); and, (d) to compare student perceptions of the educational environment across different locations or institutions within the same system (Varma, Tiyagi, & Gupta, 2005; Denz-Penhey & Murdoch, 2010; Zawawi & Elzubeir, 2012; Bakhshialiabad, Bakhshi, & Hassanshahi, 2015; Luciani et al., 2015).

Hasan and Gupta (2013) represents a typical report of the use of DREEM to measure elements of the educational environment at a single institution. They report the mean DREEM score, representing the average of the summation of individual item scores, previously described as a questionable use of the data. Within their data set, they report differences in subscale scores in the teaching and social domains, which appears to be a reasonable and useful interpretation of the data. Cocksedge and Taylor (2013) compared the student experience at the University of Liverpool by using data from DREEM as well as the UK National Student Survey (NSS). They identified individual DREEM questions that corresponded to the seven domains of the NSS and found that the results from both instruments were similar, identifying the same two weak domains; however, DREEM provided more specific data that was contextually appropriate for a medical school environment. Koohpayehzadeh et al. (2014) translated the DREEM into Persian, resulting in the removal of six items following the calculation of the content validity ratio. First, the DREEM was translated into Farsi, then back into English and "and adapted to the original questionnaire, and the gap in compliance was corrected" (p. 3). Twenty content experts rated each item for cultural relevancy in Iran, and using a content validity index method, six items were eliminated. The authors gave no specific reason for the eliminations other than via the scoring system used by the experts ("essential" = 2 points; "useful but not essential" = 1 point; not useful = 0 points), other than a vague reference to "differences in the cultural context of the countries" (p. 6). Examples of the omitted questions were #17, "cheating is a problem in this school", and #39, "the teachers get angry in class". The resultant 44 item instrument was used to measure the educational environment of an Iranian medical school and was considered a valid measure. Interestingly, this "cultural difference" was not considered one year later in 2015,

when Andalib et al. (2015) studied the utility of the full DREEM instrument in measuring the educational environment in a teaching hospital in Tehran, Iran.

DREEM has also been translated into Spanish and used in a Chilean medical school; in that study all 50 items were used and felt to be contextually appropriate (Riquelme et al., 2009). The DREEM instrument has also been used in India to study the educational environment in medical school (Bhosale, 2015) and a variety of health science programs including medicine, dentistry, public health, nursing, and physiotherapy (Sunkad, Javali, Shivapur, & Wantamute, 2015).

The instrument has also been used to measure elements of the educational environment across multiple institutions. This is how DREEM was used by Imran et al. (2015), who studied the educational environment across six medical institutions in Pakistan, concluding that they could use these results as a basis for planning and improving medical education. They administered the DREEM survey to 3045 medical students and collected 2084 completed questionnaires (68.4%). The subscale scores were used to determine which domains were the weakest or the strongest (lowest and highest subscale scores, respectively). Like so many studies using this instrument, the subscale scores were assumed to accurately represent the state of the educational environment in the respective domain. To some degree, this degree of confidence may simply reflect the wide utilization of the instrument and a general agreement or consensus among medical educators.

DREEM has also been used to monitor educational environment change following the introduction of a new medical curriculum. In this case (Finn, Avalos, & Dunn, 2014), data were compared from the administration of the DREEM instrument before and after changes in the curriculum (although the two administrations were five years apart and the participants were

different cohorts of medical students at the same university). The authors assumed that data from different cohorts of students (2004, pre-curriculum change; and, 2009, post-curricular change) represented valid measures of the environment at the same institution and therefore, they were able to make value judgments regarding what they considered a positive change in the environment. Assuming the cohorts were equivalent, this would represent a reasonable use of subscale scores of the DREEM instrument.

The DREEM instrument was used (in the previously described study) by Miles and Leinster (2009) to compare student and faculty perceptions of the medical educational environment at the same institution. There were some inherent and obvious shortcomings of the instrument in this context, for example, faculty were unable to comment on the students' social environment. Nonetheless the authors felt this was a novel use of the instrument and its use facilitated a better understanding of the environment by the faculty.

Several studies have used the DREEM to compare student perceptions of the educational environment across different locations within the same collegiate system. For example, Varma, Tiyagi, and Gupta (2005) used DREEM to measure the educational environment at eight teaching hospitals in the UK. They felt the instrument provided valid information about student perceptions of the educational climate at these varied sites (and in fact their study concluded that there were no differences between these teaching centers). Denz-Penhey and Murdoch (2010) used data from DREEM as well as interviews to compare students' experiences at 10 different sites of the Rural Clinical School of Western Australia, with an aim of determining if students were disadvantaged at small sites. In total, 342 medical students completed the survey and an undisclosed number of students were interviewed for the qualitative portion of the research. While no specific purpose was stated for the use of a mixed methods approach, it may be

speculated that the qualitative component was important to gain a more in-depth perspective of individual students regarding their placement in rural versus urban settings for their clinical experiences. Disappointingly, the paper provided data from the DREEM surveys, but did not discuss the findings or results of the interviews. The quantitative data revealed that students had more positive perceptions of smaller sites, including statistically significant scores in two of five domains (perception of learning and academic self-perception).

Zawawi and Elzubeir (2012) looked at students' perceptions at two medical schools in Saudi Arabia with different curricular orientations (one, with a problem-based curriculum; and the other with a traditional curriculum) using the DREEM instrument. A problem-based curriculum, as the name implies, uses problems for students to solve (typically in groups), and in doing so, they develop advanced cognitive abilities such critical thinking and collaborative learning skills. In contrast, a traditional medical curriculum typically refers to a didactic-based, teacher-centered curriculum. The different focus of these two curricular orientations is sometimes described thusly: problem-based is focused on learning, and traditional is focused on teaching. As medical schools adopt problem-based curricula it is important to understand student perceptions of the change in order to evaluate program strengths and weaknesses. This was the aim of Zawawi and Elzubeir who opined that their DREEM data, across two institutions, could be used to accurately compare these different environments. They also felt that their findings (and DREEM scores) were consistent with other studies of medical schools using problem-based curricular models, in which students perceive problem-based environments more favorably. The higher DREEM scores in the problem-based environment were in the domains of perception of learning, academic self-perception (that is, the approach to learning), and

perception of the atmosphere (in the class or institution), none of which is particularly surprising in the student-centered, learning-focused problem-based environment.

Bakhshialiabad, Bakhshi, and Hassanshahi (2015) used DREEM to measure students' perceptions of their learning environments in seven different health science programs (nursing [n=216], midwifery [n=68], radiology [n=55], operating room nursing [n=50], laboratory science [n=48], medical emergency [n=38], and anesthesia [n=55]), using total DREEM scores as well as subscale scores for each of these groups of students. These investigators compared the standard DREEM scores for each of these groups and concluded that the "DREEM gives a clear indication of the priorities for reform of the curriculum" (p. 201). In other words, these authors had sufficient confidence in the DREEM data to guide their curricular reform, which amounts to an implicit endorsement of the validity of the instrument.

Luciani et al. (2015) used the DREEM instrument to measure the environments in nine osteopathic medical institutions across Europe, again, using total scores as well as subscale scores. They measured total DREEM scores as well as subscale scores for nine osteopathic institutions, reporting these data as representative of the environments of these institutions. They also measured "preparedness" to practice osteopathy based on a survey developed by the Association of American Medical Colleges, however they did not provide this instrument or a description of the instrument. Their data, besides the descriptive data obtained from the DREEM subscales, indicated a positive correlation between high DREEM scores and high preparedness for practice.

DREEM has been used in nursing and midwifery education in Egypt, Pakistan and Iran, with the goal of assessing students' overall perception of their educational environments (Abusaad, Mohamed, & El-Gilany, 2015; Farajpour, Esaashari, Hejazi, & Meshkat, 2015;

Ahmed et al., 2016). In these studies, the authors assumed that the psychometric properties of the instrument, that is, its scoring system (originally developed for medical education), would be appropriate for interpretation in these fields of study. The study of nursing students by Abusaas, Mohamed and El-Gilany (2015) used total DREEM scores, subscale scores and individual item scores to compare different populations of students (pediatric and maternal). Despite previous concerns expressed in the literature regarding caution when considering the total DREEM score, these authors still reported the total score as a reflection of the overall educational environment. They did, however, seem to make more use of the individual item scores, which were likely valid measures of these areas of the environment, given the fact that they were using survey responses from 511 students. This allowed them to identify five specific environmental items (out of the 50 DREEM items) which scored lower than 2/5 and generally agreed (among DREEM users) to represent problem areas. For this purpose, the use of the instrument and their interpretation of the results appears reasonable; that is, the use of specific item analysis (with a large student population), which reflects student appraisals of specific environmental items or elements, instead of the use of the total DREEM score, which can be misleading as has been previously described.

The Faraipour (2015) and Ahmed (2015) studies surveyed nursing students in Iran and Pakistan, respectively, and in both cases concluded that their data accurately represented the students' perception of the learning environments. These two studies both assumed the validity of the instrument (example from Ahmed (2015, p. 444) … "The study (used) the already validated DREEM questionnaire") and used the total scores and subscale scores as if they were using thermometers to record the temperature; that is, assuming the scores (particularly the sub-scores) to accurately reflect the educational climate, as if they were using an accurate

thermometer that required no calibration. For single institution studies or comparative studies (i.e. two or more institutions, or the same institution before and after a curricular change) this is how DREEM is most commonly used by medical educators.

2.2.7.4. Usage of DREEM in the US and Canada.

Despite its popularity and international use, the DREEM has not been widely used in medical education in the US. Shochet, Colbert-Getz and Wright (2015) suggest that this may be because DREEM "may not be able to capture the nuances of the learning environment at US and Canadian medical schools" (p. 1). These authors give no other rationale for this statement other than the fact that it justified their development of a new learning environment instrument specific to Johns Hopkins medical school. Sue Roff, a developer of the DREEM was contacted personally and was not able to explain the paucity of use of this instrument in the US (Roff, 2016, personal communication).

Indeed, in a responsive letter to the editor, Roff and McAleer (2015) criticized Colbert-Getz, Kim, Goode, Sochet and Wright's work (2014) in which they purported to have calculated validity scores for previously published learning environment assessment tools. It was based on this analysis of 28 instruments or "tools" that they determined the need to develop their own Johns Hopkins scale. Roff and McAleer criticize the methodology used to reach this conclusion, stating that the analysis lacked robustness and neglected to emphasize that DREEM had been used in over 200 studies, all reporting robust psychometrics. Their letter ended with Roff and McAleer stating that the authors (Colbert-Getz, Kim, Goode, Sochet and Wright) "must have a very narrow view of the educational climate" (p. 698) by describing graduate medical education as merely a job training environment (without due respect for the broad dimensions of an educational environment).

2.2.7.5. Usage of DREEM in chiropractic education.

As of the date of writing this thesis, four publications were found related to the use of the DREEM in chiropractic education (two related to a Canadian institution, and two related to a Swedish institution).

Till (2004) was arguably the first to use the DREEM to evaluate the learning environment within a chiropractic college. She used the subscales to identify areas of concern which were used to inform the strategic planning process at the institution. In what appears to be a similar study at the same Canadian institution, Till (2005) again notes the utility of this instrument to inform the strategic planning process with regards to concerns identified by students. In the 2005 study she compared students' perceptions of the actual environment with their ideal educational environment, providing data useful for planning and resource utilization at the institution.

Palmgren and Chandratilake (2011) used the DREEM (including its overall score) to assess the educational environment at the Scandinavian College of Chiropractic (in Sweden), concluding that the instrument could identify specific areas in need of improvement. Interestingly, these authors felt that "investigating students' perception of the educational environment is a delicate matter" (p. 161), and there was a risk of students "not being honest to protect themselves and their peers and to avoid speaking against their teachers" (p. 162). They felt that survey-based perceptions, alone, might be misleading, because they "may be excellent even with a terrible program, as a result of extraneous factors such as institutional marketing, (and) …student ignorance as to what constitutes educational quality" (p. 161). Certainly, it is possible that survey responses may be influenced by students not taking the survey seriously, or those with "a bone to pick". Accordingly, Palmgren and Chandratilake (2011) recommended

seeking more information by using focus groups or individual interviews in future studies. This was a consideration in the present work which is a mixed methods study aiming at the verification of survey-based data through qualitative interviews.

2.2.7.6. Mixed methods research and validity of DREEM

Denz-Penhey (2009) in discussing their research with DREEM in rural Australian medical training sites also noted the importance of triangulating DREEM data through qualitative interviews, which they felt provided meaning-filled interpretations of sensitive student perceptions. These views and perspectives support the mixed methods methodology in this current study. In a follow-up study (Palmgren, Sundberg, & Laksov, 2015) at the same institution compared data at two points in time, 2009 and 2012. These authors showed a general improvement in the perception of the environment, except for perceptions about the teachers, which declined, and which were interpreted to be related to changes in the teachers' roles over the three years. These authors also discuss methodological issues related to the analysis and interpretation of DREEM data, with reference to the contributions of Swift, Miles and Leinster (2013) (although they state that they used the subscale threshold scores proposed originally by Roff et al. (1997) rather than those proposed by Swift, Miles and Leinster (2013) even though they support the methodological criticism published by these latter authors). They state that, despite the (ongoing) methodological discussion, the DREEM is "still the most widely used instrument for assessing the undergraduate professional health care educational environment" (p. 122).

The use of DREEM and its psychometry was summarized by Hammond, O'Rourke, Kelly, Bennett, and O'Flynn (2012) who described its varied and international use and its utility in identifying weaknesses and comparing different schools and cohorts within schools, as well as

it having "proved itself" as a valid instrument. Further to this, Chan, Tan, Tor and Sim (2018) reviewed the use of DREEM in 106 studies, in 30 countries (mostly in Europe and Asia) from the instrument's introduction in 1997 to 2017. They concluded that DREEM is widely used and accepted as a measure of the educational environment and that future studies should include other factors correlated with DREEM such as (among others) coping styles and personality profiles. The current study, relating DREEM to correlates of control and value, per the control-value theory, seeks to do what these authors propose.

2.3 Cognitive Appraisals of Control and Value

The control-value theory posits the intermediary role of cognitive appraisals of control and value between the educational environment and students' emotions. These cognitive appraisals relate to the perception of control over one's achievement and the subjective value or importance of achievement to the student (Artino & Pekrun, 2014). Artino and Pekrun (2014) described the cognitive appraisal of the perception of control as indicated by a perception of competence and an expectation of achievement. For example, a student who perceived a high level of competence in a course or program, and who anticipated achievement in that program might be expected to enjoy the learning process (a positive achievement emotion) which would lead to a more positive educational outcome. The cognitive importance of value, as described by Artino and Pekrun (2014) refers to the student's subjective appraisal of the importance of achievement. In common vernacular, perceived control asks, "can I master it?" and perceived value asks, "does it matter?".

For example, as posited by the control-value theory, a student who perceived no importance to achievement in a course or program might be bored (a negative achievement emotion) which could (according to the theory) lead to poor academic outcomes. Of course,

motivation for academic achievement is a complex phenomenon, subject to context and other contingencies, and moreover, the control-value theory includes the assumption of reciprocal relationships. Hence, in keeping with the assumptions of the theory, (and in the above example), poor academic outcomes could also lead to lack of interest in a course (negative achievement emotion), and therefore a perception of no importance to achievement. Another example would be a student who perceived no control over their academic performance on an exam but felt that it was extremely important to pass the course, which could, according to the assumptions of the control-value theory, lead to anxiety and frustration (negative achievement emotions) and poor performance.

Generalized assumptions such as this are subject to criticism (such as oversimplification and the reduction of a highly complex and integrated system into single elements), however, this posited path from the environment, to cognitive appraisals, to achievement emotions, to academic achievement has been widely used as a framework for studying the inter-relationships of these four elements.

2.3.1 Cognitive appraisal of control

In 1966, Rotter introduced the terms "internal control" and "external control", and the concept of the differential importance of internal control versus external control in the learning experience, claiming that internal control (that is, belief that an event or outcome is contingent upon one's own behavior or characteristics) was associated with behaviors and actions that tend towards the expectation of achievement, or achievement itself (Rotter, 1966). He reviewed earlier work in this area, and the development of an "I-E" (internal/external control) scale which was used in several experimental studies. Rotter provides a lengthy review of the determination of validity for the 29-item I-E scale, and then discusses its utility and findings in a variety of

experimental settings, ranging from students (elementary and college), to prisoners, to Peace Corps trainees. In some of these cases, broad assumptions were made regarding the reasons for the experimental findings, which, over fifty years later, might be questioned or scrutinized. For example, the assumption that prisoners would not believe the survey instructions they were given; that "one might naturally expect (prisoners) to be more external than college students" (p. 14); and, that one would expect that a group of Peace Corps volunteers would be highly internal. However, the findings in general tended to support "the stronger motivation of internals in achievement situations" (Rotter, 1966, p. 22). Later, Stipek and Weisz (1981) were able to show that students with a greater sense of control over their academic performance had better academic records than students with a lower sense of control. The perception of academic control has also been associated with a reduction of stress and depression (negative achievement emotions) (Folkman, 1984), and, in work that is rather dated but illustrates how the concept of academic control has been viewed, some authors have gone as far as to assert that a perception of internal control can be associated with better health (Thompson, 1993) and a longer life (Chipperfield, 1993).

The concept of internal control is also central to what Malcolm Knowles called "andragogy" (Taylor & Hardy, 2013), although the term was originally used by Alexander Kappin in 1833 to describe the teaching methods of Plato (Abela, 2009). As described by Knowles, andragogy describes the process of adult learning based on five assumptions, the fifth of which states that adults are more motivated by internal factors than external factors (Abela, 2009).

[Note: the five assumptions are (1) Self-Concept – from dependent to self-directed person (2) Adult Learner Experience – learning aided by reservoir of personal experience (3) Readiness to

Learn – learning is linked to social roles (4) Orientation to Learning – there is immediacy of application of learning (5) Motivation to Learn – motivation is internal]

While andragogy helped explain the motivation to learn by contrasting the characteristics of adult and child learning, it has been criticized by social constructivists for excluding social factors and context, which are considered crucial in professional education (Durning & Artino, 2011). For instance, Misch (2002) showed that internal and external motivation are not easily distinguishable in medical students because motivation is a complex and context-dependent phenomenon. The control-value theory also does not explicitly address social factors, however, its initiating element, the educational environment, includes both contextual and social factors as precursors of the cognitive appraisal of control (or internal control).

The transition from high school to college (presumably also a transition from pedagogy to andragogy, as a *modus operandi* for learning) has been described as an important step towards the development of self-initiative and autonomy; and, in this context the concept of control (or perceived control) over one's academic achievement was the subject of a longitudinal study of college-level psychology students at a large Canadian research university by Perry, Hladkyj, Pekrun, and Pelletier (2001). These authors used an eight-item Likert-based instrument to measure perceived academic control. The survey included items such as: I have a great deal of control over my academic performance in my psychology course; and, the more effort I put into my courses, the better I do. In addition to academic control (AC), this study measured student perceptions of 17 variables, such as preoccupation with failure (PWF), course boredom, course anxiety, intrinsic motivation, etc. The students (n=495) were divided into four groups: Moderate AC and High PWF; Moderate AC and Low PWF; High AC and High PWF; and, High AC and Low PWF. The means and standard deviations of all 17 variables were calculated for each of

these four groups, and the main effects and interactions were provided in an F-table (showing the level of significance of the means of two variables following a regression analysis). This study produced a plethora of findings (considering the authors measured the interaction of 17 variables in four population groups), but one of their main observations was that high-control students scored higher in many positive attributes such as motivation and perceived control over life, and lower in negative attributes such as boredom and anxiety, and that these students obtained higher final grades. These observations support the importance of the perception of control as a precursor of positive achievement emotions and improved academic outcomes, as postulated by the control-value theory.

A three-year study of 524 Canadian college students (Perry, Hladkyj, Pekrun, Clifton, & Chipperfield, 2005) examined what they termed the paradox of failure in which bright students fail courses or drop-out from their studies. It was found that, while many factors can be shown to be predictors of academic success, students with high levels of perceived academic control earned higher grade point averages and withdrew from fewer courses, in support of the assumptions of the control-value theory. This study measured academic control, using the 8-item scale previously used by Perry, Hladkyj, Pekrun, and Pelletier (2001) , preoccupation with failure (using a 12-item scale previously tested instrument), and self-reported high-school final grade (HSG) as their independent variables. Their dependent variables were year-end cumulative GPA and course withdrawal rate. Correlational analysis showed that higher academic control was associated with higher HSG ($p<0.05$) and higher GPA ($p<0.001$) in all three years, and lower withdrawal rates in year 1 ($p<0.05$). Pre-occupation with failure was not significantly correlated with any other measures. This work, therefore, supported the importance of high, or positive, academic control, as a predictor of academic achievement, and subsequent

research by Stupnisky et al. (2007) found positive academic control to be a better predictor of first-year college performance than self-esteem. In a more recent inquiry into whether positive academic control or self-esteem is more important to students' well-being (as an important mediator or contributor to academic achievement), it was found that both of these factors are important for academic performance (Stupnisky, Perry, Renaud, & Hladkyj, 2013). Based on their study of 776 college-level psychology students in which the strength of relations between self-esteem and perceived academic control was determined through confirmatory factor analysis, it was concluded that students who "maintain both a higher sense of control and self-esteem while in college…will experience a more positive well-being and perform better academically" (p. 156). This study also confirmed the predictions of the control-value theory by showing that perceived academic control negatively predicts negative achievement emotions such as boredom and anxiety, and positively predicts positive achievement emotions such as enjoyment (as demonstrated by regression analysis, with findings confirmed at $p<0.05$).

A study of Filipino high-school students used the control-value theory as a framework to look at the impact of students' implicit beliefs in intelligence on their achievement emotions (King, McInerney, & Watkins, 2012). It was assumed that those students who viewed intelligence as fixed (the entity theory of intelligence) would perceive less academic control than students who viewed intelligence as malleable (the incremental theory of intelligence). This assumption was grounded in the control-value theory which predicted negative achievement emotions for the entity theory students. The findings confirmed that the entity theory of intelligence (positively) predicted negative achievement emotions such as anger, anxiety, shame, hopelessness and boredom. Gender and academic level did not predict achievement emotions but, importantly, a significant amount of variance was explained by parental and teacher support,

suggesting the importance of appropriate feedback by parents and teachers. It was suggested that instead of praising students for their academic ability (which facilitates student belief in the entity theory), teachers and parents can focus on praising students for their effort, in support of the incremental theory. While this study used the control-value theory as a framework for situating theories of intelligence, it did not look at the predictors of these two orientations towards intelligence, other than to mention the importance of the influence of teachers and parents. These inputs would be measured to some extent by the DREEM instrument (in the subscales of perceptions of teaching and social self-perception) which is the aim of the current study. In a related study of this same population of Filipino high-school students, King (2012) looked at the relationship between students' orientation towards intelligence (that is, entity theory or incremental theory) and a broader range of social and well-being outcomes, such as self-esteem and relationship harmony. The findings were consistent with the companion study in that students with entity or fixed views of intelligence exhibited poorer achievement and negative emotion outcomes. Students viewing intelligence as malleable (incremental theory) exhibited statistically significant correlations with personal self-esteem, collective self-esteem, relationship harmony, positive affect, positive emotions, achievement, (and negative correlations for negative emotions). These data suggest that students holding an incremental view of intelligence (and therefore exhibiting higher levels of perceived control) not only perform better in school but carry this benefit into social and personal well-being out of school. While these two studies used participants, who were in high school rather than in college or university, the findings nevertheless tend to support the assertions of the control-value theory with regards to the linkage between the cognitive appraisal of academic control and achievement-related emotions.

Another perspective regarding the perception of academic control is its association with self-regulated learning, a vital skill for continuing (lifelong) education in the healthcare field (Artino, Hemmer, & Durning, 2011). The results of their study of 248 medical students showed that high-performing students (in a clinical reasoning course requiring self-regulated learning) "placed greater value on learning activities and have greater confidence in their ability to learn" (p. S37), reflecting higher value and control (vis-à-vis control-value theory), respectively.

Instruments have been developed and used to measure the concepts of control and value, but these studies have generally focused on elementary students and non-medical, non-healthcare college students. (Perry, Hladkyj, Pekrun, & Pelletier, 2001; Frenzel, Pekrun, & Goetz, 2007a; Buff, 2014).

The cognitive appraisal of perceived control over one's academic achievement has be measured by an eight-item Primary Academic Control Scale developed by Perry et al., (2001) which was designed for use with college-level students. This scale appears to be a *de novo* instrument that was "based on the social cognition literature, which has generated a host of single- and multiple-item measures" (Perry et al., 2001, p. 777). Ultimately the authors chose eight items "related to influencing academic achievement outcomes" (Perry et al., 2001, p. 779). A subsequent study of the mediational role of perceived control on achievement emotions by Hall, Sampasivam, Muis and Ranellucci (2016) referred to their instrument as a "5-item subscale of the Primary Academic Control Scale", providing no specific rationale for the deletion of three of the original eight items. The three deleted items could be considered redundant or perhaps even contextually confusing (such as "how well I do in my courses is often the 'luck of the draw'"). Nathan Hall felt that the selected five items were inclusive of the elements of academic control and enough to measure this variable (Hall, personal communication, 2016).

These five items, reflecting the characteristics associated with perceived control over one's academic performance were selected for use in the present study. This previously used subscale of the Primary Academic Control Scale was generated from this literature related to social cognition and was considered to be an appropriate instrument to meet the needs of the current research study.

2.3.2 Cognitive appraisal of value

Eccles et al. (1983) developed a 51-item Valuing of Education Scale (VOE) to assess the valuing of math and reading by grade-school students, as part of a broader inquiry into achievement motivation, which led to the development of the expectancy-value theory of achievement motivation (Wigfield, 1994). The expectancy-value theory posits that academic achievement performance and choice of achievement tasks is predicted by expectancy of success in the tasks, and the subjective value that is attached to success in the tasks. This model bears similarity to the control-value theory, and investigations into both theories have included measurements of the value that students place on their achievement. The work of Eccles et al. (1983) builds on and attempts to integrate two broad perspectives related to the study of values. One approach to this study is based on Atkinson's early work on incentive value (Atkinson, 1957) which holds that different tasks meet different needs of individuals. The other approach is based on Rokeach's approach, focusing on values as broad-based psychological characteristics which might affect behavioral choices (Rokeach, 1973). The resulting integration of personal values within the expectancy-value framework led Eccles and her co-workers to define four aspects of the subjective perception of value that can influence behavior: attainment value (the importance of doing well on the task), intrinsic value (the enjoyment an individual derives from the task), utility value (the value of the task to future goals), and cost (Wigfield & Eccles, 1992).

The VOE contains ten items related to attainment value, eight items related to intrinsic value, nine items related to utility value, and 24 items related to cost. In describing the validity of the VOE, Wigfield and Eccles (1992) stated that "few measures of achievement task values exist in the literature" (p. 301), and that Eccles' Valuing of Education Scale has been "shown to be reliable, (and) have discriminant validity" (p. 301).

Cognitive appraisal of value orientations was studied by Battle and Wigfield (2003) in an examination of the values of female students as predictors of their decision to undertake graduate studies. Their study used the 51-item Valuing of Education (VOE) scale, based on the earlier work of Eccles (1983). The original VOE scale was developed primarily to assess grade-school students' valuing of mathematics and reading so Battle and Wigfield modified Eccles' original items to suit the context of value orientations of graduate students. An example items is "I find the idea of being a graduate student to be very appealing". Consistent with the original VOE scale, the revised instrument measured four components of the subjective perception of value: attainment value, intrinsic value or enjoyment, utility value or usefulness, and cost. These authors noted that the factor analysis of the items related to value revealed factors (in this population of graduate students) different from the original work of Eccles et al. in 1983 on students at a lower academic level. In Battle and Wigfield's study, factor analysis combined the two value components, attainment and intrinsic value, into a single factor. Utility value remained a separate factor, as did cost. Cost contributed to only one-fourth of the effect of the combined factor "intrinsic-attainment", and the authors felt that the participants in this study "appear to see few costs associated with the pursuit of graduate education" (Battle & Wigfield, 2003, p. 70). In describing the previous work of Eccles (1983), Battle and Wigfield (2003) state that perception of value is mostly important in determining one's decision to engage in that field,

whereas perception of control (called self-concept of ability by Eccles) is mostly important in determining one's performance in the chosen field.

Eccles and Wigfield (1995) investigated adolescents' achievement task values and expectancy-related beliefs in a study of over 700 middle-school students. Based on their literature review and previous work, (as well as their factor analysis of 29 originally used items) they measured the perception of value with seven items (three measuring attainment value, two each measuring intrinsic value and utility value). These three elements have been shown to positively predict achievement whereas the fourth component, cost, "in contrast, is best thought of as those factors (such as…anxiety and…cost of failure) that affect the negative valence of the activity" (Eccles & Wigfield, 1995, p. 216). These authors do not explicitly describe why they selected a subset of 29 items of the original VOE, but they allude to previous studies and their review of the literature several times in their work. They also refined the items through exploratory factor analysis (to eliminate redundant items) and confirmatory factor analysis (to further refine the instrument in a similar manner to exploratory factor analysis; and, best used when models are derived from explicit theories). This statistical analysis of items resulted in their refinement to the seven items used to measure value. These seven items appear in their appendix (p.224) but their text refers to five items used to measure value (p. 220). A thorough review of the paper does not reveal any reason for this discrepancy other than due to a typographical error.

A shorter instrument was used by Hall et al. (2016; and Hall, personal communication, 2016) in their study of achievement emotions, control and value in 273 college students. These authors stated that they used a "domain-general version of the seven-point, 5-item scale" (p. 319) that had been developed by Eccles and Wigfield (1995). Nathan Hall was contacted personally

and provided the five specific items used in this study. Five of them are adapted from Eccles and Wigfield's seven-item value scale. The two eliminated items were domain-specific for mathematics and considered redundant (Hall, personal communication, 2016). The five selected items included one intrinsic value, three attainment value, and one utility value items. Validity of the instrument was supported by the selection of the five items which was based on the contextual appropriateness for the subject population, as well as the use of these items in previous studies of value. Reliability was demonstrated by a Cronbach alpha value of 0.86 for these five questions, which were summed to create a single multidimensional scale of value (consistent with Pekrun's approach because the control-value theory does not differentiate among specific value types but rather considers value holistically). Pekrun (2006) considered cognitive appraisal of value to be intrinsic (i.e. to the value of the activity or outcome itself, as in studying a field for its own sake) and extrinsic (i.e. relating to the utility of the activity or outcome, as in valuing academic grades to attain recognition from others, such as parents or teachers; while Pekrun called this "extrinsic", it appears to be the same as "attainment" value, as used by Eccles and others), and that these could be combined to provide a single measure of perceived value.

Sobral (2004) studied 282 Brazilian medical students' perception of the value of course learning, content learning, personal learning and behavioral learning; and, in the context of the present research, is notable for having explored the relationships between the educational environment, as measured by DREEM, and dimensions of value, as measured by a 36-item Course Valuing Inventory (CVI). The CVI instrument was developed in 1978 by Nehari and Bender (1978) as part of an investigation of 141 students at Boston University into the meaningfulness and value of a course of study. This instrument was deemed reliable following

the determination of reliability coefficients between 0.77-0.92 for the four subscales and 0.95 for the total test. Validity was assumed through theoretical development of the instrument as well as through content validity by expert developers. The instrument has four subscales: course valuing, content learning, personal learning, and behavioral learning. It was developed with the assumption that learners are legitimate evaluators of their own learning. The Nehari and Bender study (1978) showed that perceived course value was related to the three domains of learning. In this study, "course valuing" was considered a student judgment of the meaningfulness of a course (to the student). This roughly corresponds to a combination of attainment value and utility value, as measured by Eccles et al. (1983), Eccles and Wigfield (1995) and Hall et al. (2016), though it does not explicitly include the element of enjoyment that an individual derives from the task of learning (intrinsic value). Interestingly, the Nehari and Bender study preceded the work of Eccles and her associates but is perhaps prominently missing from her bibliography of references.

Sobral's (2004) study of Brazilian medical students identified the course valuing subscale as "worthiness of experience", again, related to Eccles' dimensions of perceived value but not specifically or explicitly referring to any of her three subscales of value. Sobral's findings via correlation analysis included a positive relationship between value (as measured by the seven-item "worthiness of experience subscale of the CVI) and five attributes: academic achievement, self-confidence as a learner, motivation to learn, meaning orientation to learning, and reflection in learning, in order of increasing strength of correlation. Also, CVI scores correlated positively with DREEM subscale scores, with the strongest relationships with the subscales of perception of learning and social self-perceptions. All these relationships support the assumptions of the control-value theory, with higher perceptions of value ("does it matter?") being associated with

elements of the educational environment, and predictive of academic achievement and the emotional states that facilitate or lead to academic achievement.

In summary, five items based on Hall et al.'s work (Hall et al., 2016) were selected to measure the cognitive appraisal of value, loosely translated as "does it matter?". These were considered appropriate for the needs of the current research study.

2.4 Achievement Emotions

These control and value appraisals are proposed to predict what Pekrun called "achievement emotions", which in turn impact educational outcomes (Pekrun, Goetz, Frenzel, Barchfield, & Perry, 2011). Some authors, when studying the academic environment, have called these emotions "academic emotions" (King & Gaerlan, 2014), including Pekrun who described academic emotions as a contextual subset of achievement emotions, but the concept remains the same as in Pekrun's control-value theory. Indeed, King and Gaerlan, in their study of Filipino college students, stated that "the study of emotions in the school context has mostly been dominated by Pekrun's control-value theory…which has emerged as the dominant framework for examining emotions in achievement-related settings" (p. 82).

Pekrun said that emotions are "of primary educational importance" (Pekrun, 2006, p. 333) as mediators of not only academic outcomes but well-being outcomes as well. Also, because of their mediating role in the framework of the control-value theory, they can be influenced by students' perception of their environment, as well as their cognitive appraisals of control and value. Finally, because of the reciprocal linkages proposed in the control-value theory, emotions can also exert a retrograde influence on perceptions of the environment and cognitive appraisals (Pekrun, 2006). Researchers in higher education have accepted these

assumptions for the context of medical education (Artino, Holmboe, & Durning, 2012a; Artino & Pekrun, 2014).

Pekrun categorized achievement emotions as prospective outcome emotions (i.e. related to looking ahead, such as hope and hopelessness), retrospective achievement emotions (i.e. looking back at a scenario, such as joy and anger), and activity-related emotions (i.e. experienced in the present, such as enjoyment and boredom). Based on these three categories, he described 14 different achievement emotions, and the control-value theory makes assumptions relating these to cognitive appraisals of control and value (Table 2-1).

Table 2-1: Assumptions of the control-value theory (adapted from Pekrun, 2006, p. 320)

Focus	Cognitive appraisal of value	Cognitive appraisal of control	Achievement emotion
Prospective outcome	Positive	High	Anticipatory joy
		Medium	Hope
		Low	Hopelessness
	Negative	High	Anticipatory relief
		Medium	Anxiety
		Low	Hopelessness
Retrospective outcome	Positive	Irrelevant	Joy
		Self	Pride
		Other	Gratitude
	Negative	Irrelevant	Sadness
		Self	Shame
		Other	Anger
Activity	Positive	High	Enjoyment
	Negative	High	Anger
	Positive or Negative	Low	Frustration
	None	High or Low	Boredom

Table 2-1 shows the multidimensional nature of the various relationships between value, control, and achievement emotions.

Artino and Pekrun (2014) adapted this taxonomy of achievement emotions in 2014 to illustrate them as a three-dimensional taxonomy. The three dimensions were (1) valence (achievement emotions can be described as either positive (or pleasant), such as enjoyment, or, negative (or unpleasant), such as anxiety); (2) psychological activation (describing the object focus as either activating, such as anger, which is negatively activating; or enjoyment, which is positively activating; or de-activating, such as boredom, which is negatively deactivating; or relief, which is positively deactivating); and (3) outcome (describing the resultant, or related achievement emotion). This three-dimensional taxonomy describes sixteen achievement emotions, overlapping but slightly different than Pekrun's fourteen in 2006 (Table 2-2).

Table 2-2: Assumptions of the control-value theory (adapted from Artino and Pekrun, 2014, p. 1696)

	Positive (or pleasant)		Negative (or unpleasant)	
Focus	Activating	De-activating	Activating	De-activating
Activity	Enjoyment	Relaxation	Anger, Anxiety, Frustration	Boredom
Outcome	Hope, Joy, Pride, Gratitude	Relief, Contentment	Anxiety, Anger, Shame	Hopelessness, Sadness, Disappointment

Early work by Pekrun and his associates (Pekrun, Goetz, Titz, & Perry, 2002) defined academic emotions as the subset of achievement emotions that were experienced by individuals in an academic setting. The array of emotional states was generally described as either positive or negative, and these authors reported on the very high percentage of papers describing anxiety (only one of 17 academic emotions they described) and the considerable paucity of literature describing the other emotions. For example, from 1991 to 2000, there were over 500 papers on anxiety in students, but only nine on hope (considered by Pekrun as the complement of anxiety).

It has been said that emotions are ubiquitous in medical education (Artino, Holmboe, & Durning, 2012b), especially in clinical settings where students are often faced with very challenging and emotion-laden tasks. McConnell and Eva (2012) agree and emphasized the role of knowledge and skill transfer in medical education. They reviewed the literature on research on the relationship and interaction between emotion, learning and knowledge transfer, and concluded that emotions can indeed influence the learning of complex medical knowledge and the ability to transfer that knowledge to new scenarios. A more recent work in 2017 reviewed the literature and agreed that emotions can and do affect clinical decision making among healthcare professionals, although this is not widely acknowledged (Koslowski, Hutchinson, Hurley, Rowley, & Sutherland, 2017). Accordingly, the control-value theory has presumed utility in medical education in elucidating the proximal causes of achievement emotions and their consequences for learning and medical performance. Durning et al. (2010) agree and emphasize that the sub-optimal outcomes associated with negative emotions such as boredom and anxiety may have serious implications in the medical setting. Artino, Holmboe and Durning (2012a, 2012b) have described the importance of the control-value theory in medical education, and, based on its theoretical construct with the educational environment playing a role as the primary cause, they have suggested "the notion that instructors can and should create learning environments that foster a high degree of control and value for students" (Artino, Holmboe, & Durning, 2012b, p. 243).

2.4.1 Academic Emotions Questionnaire (AEQ).

Based on his work on achievement emotions, Pekrun and his associates developed the Academic Emotions Questionnaire (AEQ) in 1992 (Pekrun, Goetz, Titz, & Perry, 2002). This instrument is a self-reported survey of nine academic emotions that can be experienced by

students. This is a rather lengthy instrument with 232 items, covering 24 scales organized in three sections (class-related emotions – enjoyment, pride, anger, anxiety, shame, hopelessness, and boredom; learning-related emotions – perceptions of how class-related emotions impact learning and studying; and, test-related emotions – enjoyment, pride, hope, relief, anger, anxiety, shame, and hopelessness, and how these emotions impact test-taking performance). Each of the 24 scales has items measuring affective, cognitive, motivational and physiological components of the respected emotion. And, each of the three sections has groupings of items focusing on emotions prior to the experimental activity or setting (prospective outcome emotions), during the activity (activity emotions), and after the activity (retrospective outcome measures). The instrument has been widely used and was validated in a study of 389 college-level psychology students (Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011). That study also provided data supporting the assumptions of the control-value theory by showing positive correlations between appraisals of control and value, and positive academic emotions, and positive academic outcomes (as measured by GPA). In making this point, the authors stated, "the findings show that students' achievement emotions are linked to their control and value appraisals…and academic performance. In doing so, they corroborate…the propositions of Pekrun's (2006) control-value theory" (Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011, p. 46). The only element of the control-value theory missing is the educational environment which was not addressed, representing a gap in the literature.

Specific scales of the AEQ can be used in focused research on emotions and their control and value antecedents. Pekrun and his associates (Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2010) used the Learning-Related Boredom scale of the AEQ in a study of 203 German college students. These data were correlated with measures of control and value, as well as perceived

academic performance. As predicted by the control-value theory, control and value correlated negatively with boredom, and boredom related negatively to perceived performance. While the educational environment was not addressed in this study, the authors concluded with advice to educators and administrators to pay attention to boredom and its antecedents and outcomes when designing academic settings (p. 546). Interestingly, Pekrun and his associates continued their work on boredom by demonstrating a reciprocal causation effect of boredom and academic achievement in a study of 424 Canadian college students (Pekrun, Goetz, Hall, & Perry, 2014). Predictably, boredom had a negative effect on academic achievement, and the results also showed that poor academic achievement had a subsequent effect causing or aggravating boredom. This finding agrees with the theoretical model which includes reciprocal linkages and relationships, but it also understates the importance of manipulating the environment to reduce the likelihood of boredom, since the reciprocity of boredom and poor achievement may create an independent positive-feedback loop.

In another study using a subscale of the AEQ, Buff (2014) confirmed the assumptions of the control-value theory in a study of 431 mathematics students, by demonstrating that improvements in perceived control and value were associated (as predicted) with improved scores on the Enjoyment subscale of the AEQ. Buff's study sought to study the enjoyment of learning and its personal antecedents, and he used a latent-change model, in which individual scores were measured at different time periods (in this case, eight months) resulting in intraindividual score differences. Changes (increases) in perceived control and value over the eight-month period tended to be associated with changes (increases) in the emotion of enjoyment, as measured by the Enjoyment subscale of the AEQ, something predicted by the assumptions of the control-value theory (Pekrun, 2006, p. 320).

2.5 Educational and Performance Outcomes

As previously stated, it may appear self-evident that the educational environment can influence student performance. Statements such as "the quality of the learning environment markedly affects learning" (Aghamolaei et al., 2014) are not uncommon, and often held as assumptions rather than determined by research. Wayne et al. (2013) considered this a common and widely held assumption, but also a "muddied" one, given the fact that Mayya and Roff (2004) demonstrated that academically strong students rated their environment higher than poorly performing students, and that, without controlling baseline academic performance, the association of these variables cannot be assumed to reflect a causative relationship. It should be noted that this retrograde effect, that is, highly performing students rating their learning environments positively, is predicted by the control-value theory which posits reciprocal relationships of its four components (environment, cognitive appraisals, achievement emotions, and outcomes).

High academic control was associated with higher grades in a study of 524 college students over two semesters (Perry, Hladkyj, Pekrun, & Pelletier, 2001). Two measures of control were used (academic control and action control which was also called preoccupation with failure) and students were divided into four groups in a 2X2 matrix by academic control (high or low) and failure preoccupation (high or low). Academic control was measured by the eight items of the Primary Academic Control scale (previously mentioned). Reliability was established with Cronbach's α=0.80. The survey items represent self-evident statements that provide a measure of face validity and content validity. The results demonstrated that high academic control students exhibited less negative achievement emotions (boredom and anxiety) and obtained higher grades. Students scoring high in both measures of control outperformed students in the

other three groups in final grades by 1-2 letters. The authors make a good point in their conclusion, though, that academic control was measured as either moderate or high for the purposes of data analysis, which skewed the responses upward. As the authors note, "we know little about the truly low-control students" (p. 785), although they also comment that low control students are not likely to enter college in the first place (Stipek & Weisz, 1981).

Academic performance was tracked longitudinally for three years in a previously described study that measured perceived control and grade point averages (GPA) in 524 Canadian college students (Perry, Hladkyj, Pekrun, Clifton, & Chipperfield, 2005). A similar 2X2 matrix was used in this study (high or low control X high or low GPA) and the results indicated that students with high academic control had higher GPAs and fewer course withdrawals; specifically, those students with high academic control and high concern about failure (both measures of high control) had the highest GPAs. As the authors point out by referencing Perry and colleagues (Perry, Clifton, Menec, Struthers, & Menges, 2000), however, the consequences of high academic control can vary considerably depending on the institution type – something that has important implications for the current study in which academic control will be measured in a population of chiropractic students.

In a study "informed by Pekrun's control-value theory" Ranellucci, Hall and Goetz (2015, p.98) studied the effect of academic emotions in 203 "North American" college students over two years and they found that enjoyment was associated with higher GPAs, and that boredom and anxiety were associated with lower GPAs. The measures included achievement emotions, as measured by three subscales of Pekrun's Achievement Emotions Questionnaire, and academic performance, as measured by sessional GPA. The results of correlational analysis and the construction of structural equation models (showing statistically significant paths, or

connections, between the variables) provided support for the control-value theory linking positive achievement emotions with higher academic performance.

Achievement emotions were correlated with medical national board examination results by Artino, La Rochelle, and Durning (2010), which, in the authors words, used a model adapted from Pekrun's control-value theory for "the theoretical foundation of the…study" (p. 1204). These authors measured the variables of control and value with two previously used and validated subscales (of 6-items and 5-items, respectively), achievement emotions (using three subscales of the AEQ), and academic achievement with course grades and National Board exam scores. In other words, three of the four elements in the control-value sequence were measured, with the exception being the educational environment (which is one of the variables in the present study). As in the previously described study, correlational analysis and the construction of structural equation models confirmed the hypothesized relationships As the authors note, their results "largely confirmed the hypothesized relations between beliefs, emotions and achievement" (p. 1203). Specifically, scoring higher on the enjoyment subscale of the AEQ was positively correlated with the national board examination scores (standardized regression coefficient = 0.31, $p<0.05$) and the subscale scores for anxiety and boredom were negatively related to course examination grades (standardized regression coefficients = -0.36 and -0.27 respectively, $p<0.01$ for both). Interestingly, while elements of the educational environment were not measured in this study, the authors allude to its importance in their conclusion by stating, "these findings suggest that medical educators may in fact have some degree of control over educational outcomes through the choices they make about how a course is taught, which may have implications for students' motivation and emotion" (p.1211).

Another test of the assumptions of the control-value theory (that emotions influence outcomes) was performed by Villavicencio (2011) on 220 engineering students. The negative emotions of anger, anxiety, shame, boredom and hopelessness were measured by subscales of the AEQ, and academic achievement was measured by final grades in trigonometry. The results showed that anxiety, and hopelessness significantly negatively predicted academic achievement (regression coefficients = -0.23, $p = 0.003$ and -0.19, $p = 0.002$ respectively).

Wayne et al. (2013) studied the relationship between students' perception of the learning environment and academic performance in 271 medical students in the USA. Controlling for prior academic ability and using a shortened version of the Learning Environment Questionnaire (only 30 items, representing five subscale domains) they determined that positive perceptions of the learning environment were associated with high academic performance, giving support to the assumption that a positive learning environment leads to better academic outcomes. King and Gaerlan (2014) measured self-control, academic emotions and academic outcomes in 385 college students in the Philippines. Self-control was measured with a previously used and tested 13-item instrument, and academic emotions were measured with a shortened version of Pekrun's AEQ. Their data on academic outcomes were based on self-reported academic achievement which may weaken their proposed path. The internal consistency of the instruments was 0.74-0.90, which was considered good by the authors. A path analysis revealed statistically significant relationships between positive emotions and positive academic outcomes, and negative emotions and negative academic outcomes. Their work referenced the control-value theory as the "dominant framework for examining emotions in achievement related settings" (King & Gaerlan, 2014, p. 82).

Performance outcomes in medical education are not just a matter of better grades in medical courses, but rather there are serious implications to less than optimal performance in a medical scenario or environment. For example, Artino and Dong et al. (2012) studied 304 medical students' perceptions of the educational environment, self-regulated learning behaviors, and academic outcomes (as measured by the students' cumulative medical school GPA). Students' perceptions of the learning environment were measured with a 13-item previously used and tested scale, and learning behaviors were measured with a 17-item scale constructed from a combination of a previously used instrument and items adapted from the literature. Internal consistency of the instruments was acceptable, in a range of 0.78-0.91. While perceptions of the environment tended to change during medical school, the impact of environmental perception on learning behaviors and performance outcomes did not. The authors conclude with potentially important advice for medical educators: "…our results could help medical educators appreciate that classroom environments, clinical settings, and teacher behaviors can have on students' self-regulation and achievement. Such an appreciation may be a critical first step to creating learning environments that encourage the lifelong learning behaviors reputed by many to be so critical to safe and effective practice." (p. 1380).

Smirnova et al. (2017) studied learning climate evaluations and their association with adverse perinatal events at 16 obstetrics departments in the Netherlands. One hundred and three graduate medical physician residents responded to a learning climate survey and these data were analyzed, by multilevel logistic regression methods, for association with adverse medical events. The learning climate survey was the D-RECT instrument that had been developed in the Netherlands "based on qualitative research, expert opinion, and a Delphi panel" (Smirnova et al.,

2017, p. 1741). The results indicate that the learning climate was "associated with a significantly increased odds of adverse perinatal…outcomes" (p. 1740).

Despite the numerous studies describing the relationship between the educational environment, cognitive appraisals and educational outcomes, and their importance to the design of clinical learning environments (including the pragmatic medical educational outcome of patient safety and quality medical care), there does not appear to be evidence that this information has yet translated into educational practice. Indeed, Artino, Holmboe and Durning (2012a, p. e158) state that the empirical support for the control-value theory has important implications for educational practice, and conclude with a call to action: "If our aim is to truly improve medical education, it seems the time has come for a rigorous, theory-based research agenda that includes consideration of ''non-cognitive'' constructs like emotion."

2.6 Summary

Pekrun and Stephens (2009) reviewed the control-value theory and the role of regulating emotions. The control-value theory posits a sequential relationship from the educational environment, to cognitive appraisals of control and value, to academic emotions, to academic outcomes; and, that these relationships are not only unidirectional, but reciprocal (suggesting, for example, that positive academic outcomes could influence emotions, as well as vice versa). This being the case, Pekrun and Stephens suggest that regulating the emotional state of students could influence not only their emotions, but reciprocal effects on cognitive appraisals could occur, as well as a direct and indirect effect on outcomes. They proposed seven mechanisms which might regulate emotions in the academic context, and therefore might promote even better academic outcomes than would be expected with positive academic emotions. These seven mechanisms include: directly targeting emotions through medication or relaxation techniques; changing

cognitive appraisals through training; regulating or changing achievement goals and beliefs, which in turn influence cognitive appraisals, through therapy; study strategies to become more competent in the subject matter; selecting educational environments that match individual goals and competencies; making better use of educational environments by seeking help; and, regulating environments by changing the achievement climate in classrooms. With this last suggestion from Pekrun and Stephens, we have come full circle – from the educational environment to academic outcomes, per the control-value theory, and a proposal by Pekrun himself for the utility of the theory by attempting to change the educational environment to improve academic and performance outcomes.

In the context of medical education, in general, and chiropractic medical education, specifically, improving academic and performance outcomes is particularly important because of the changes occurring in 21st century health care practice (Thibault, 2016). George Thibault, President of the Josiah Macy Jr. Foundation said, "at a time of dramatic change in health care delivery and the important necessary changes in how we prepare physicians for 21st century practice, it is imperative that we develop closer links between education and health care delivery. We need to stop thinking of education and health care delivery as 2 separate systems, but rather think of them as united in the common goal of improving the health of the public they serve" (Thibault, 2016, p. 135).

Buff (2014, p. 27) describes the implications for future research and, in support of the current thesis topic, states, "…the question arises of which instructional or educational practices might positive influence control and value, and from which practices educators might wish to distance themselves."

This is the aim of research on the control-value theory in the context of chiropractic medical education – the elucidation of the relationship between the learning environment and cognitive appraisals of control and value, in order to better understand how to improve those appraisals to influence academic emotions and performance outcomes (including the ultimate target of the performance – quality patient care). A search of the current literature suggests that this has not yet been investigated and therefore there is no evidence that an understanding of the educational environment and its effect on cognitive appraisals of control and value has had an impact on chiropractic medical education.

This study is inquisitive (or descriptive) in nature, as opposed to being predictive (or inferential). Accordingly, in seeking evidence and using an inductive reasoning model, a research question is posed. This is in contrast to a deductively reasoned model seeking evidence to refute a premise, in which case a hypothesis would have been stated (Connelly, 2015). The specific research question posed in this thesis is described in Chapter 3 (page 68).

2.7 Gap(s) in the literature

The four individual elements comprising the control-value theory (educational environment, cognitive appraisals of control and value, achievement emotions, and academic outcomes) have been studied individually and in accordance with their various relations (such as the relationship between cognitive appraisals and achievement emotions, or achievement emotions and academic performance). The four elements and their various inter-relationships have been discussed in detail. Several authors have noted the importance of the educational environment as the antecedent of cognitive appraisals of control and value (and therefore primary element in the four-element sequence postulated by the theory). However, despite considerable research on the educational environment, and on the control-value theory, and

despite many calls for noting the significance of the educational environment as a precursor of academic achievement, there does not appear to have been any investigation into the relationship between factors in the educational environment and cognitive appraisals of control and value. Furthermore, there have been calls to elucidate the elements of the control-value theory in medical education, a field in which a well-developed measure of the educational environment (DREEM) has been developed; yet there does not appear to be any published investigation in medical education linking the findings of DREEM to cognitive appraisals of control and value. Lastly, while a few studies have investigated DREEM as a measure of the educational environment in chiropractic medical education, there exists a paucity of literature describing the nature of the chiropractic educational environment, and there is no existing literature describing the control-value theory in the context of chiropractic medical education. The studies using DREEM in chiropractic education did not seek to correlate the environmental findings with other factors, such as cognitive appraisals of control and value. Accordingly, this research seeks to investigate the relationship between the educational environment (as described by the DREEM instrument) and cognitive appraisals of control and value, in a population of chiropractic students at an American university. The findings of this research may have implications for chiropractic educational leaders in constructing or reforming curricula in order to maximize environmental factors that are linked to positive cognitive appraisals of control and value.

Chapter 3 - Practice-Based Research Question

The control-value theory has been studied in several contexts, such as elementary schools and a variety of college level environments (Frenzel, Pekrun, & Goetz, 2007; Pekrun, et al., 2010; King & Gaerlan, 2014), but it was not explicitly brought to the attention of medical educators until 2012 (Artino, Holmboe & Durning, 2012a; Artino, Holmboe & Durning, 2012b).

As described above, much of the emphasis has been on the nature of achievement emotions and their effect on educational outcomes, rather than on the precedents of these emotional states, which include subjective appraisals of control and value, and ultimately, the educational environment.

The subject of this research is the relationship between the educational environment and subjective appraisals of control and value, and therefore the general line of inquiry is whether factors in the educational environment can influence control-value appraisals as precedents of positive achievement emotions. More specifically, in the context of the proposed research, the question that is being posed is as follows:

> **Does the experience of first- and second-year chiropractic medical students support the hypothetical relationship between the educational environment and subjective appraisals of control and value?**

This research would fill the gap, albeit with a participant population that is not necessarily representative of a traditional medical school, between the educational environment and achievement emotions. It would respond to the suggestion of Artino, Holmboe and Durning (2012a, pg. e157), that research based on the control-value theory seek to answer the question, "How can medical educators enhance students' achievement emotions to improve learning?" Since we are relatively assured that achievement emotions influence educational outcomes, we

need to know how to positively influence those achievement outcomes and it is possible that relevant environmental factors can be identified. This would be particularly relevant and significant in the chiropractic educational context since so little is known about the factors leading to academic achievement in populations of chiropractic students. The structure of chiropractic educational programs has considerable similarity to that of allopathic medical programs, with similar subject matter and length of studies (with the major difference that chiropractic programs do not include practical obstetrics or surgery and replace these studies with conservative therapeutics emphasizing manual therapies such as manipulative therapy). Accordingly, much of what is known about chiropractic education is based on medical education literature and assumed to be applicable in the chiropractic context.

The line of reasoning from this starting place is as follows: factors known to, or likely to improve educational outcomes would be important to educators; so-called "achievement emotions", which appear to be strongly related to students' subjective appraisals of control and value, have been shown to correlate with higher academic achievement (that is, desired educational outcomes) (King & Areepattamannil, 2014; King & Gaerlan, 2014; Villavicencio, 2011); while defining the educational environment can be difficult and context-variable (Pekrun, 2006; Frenzel, Pekrun & Goetz, 2007), this subject has nonetheless been of considerable interest in medical education, with evidence that student satisfaction with the learning environment is a key factor in determining student well-being and positive educational outcomes (Dyrbye et al., 2009; Finn, Avalos & Dunne, 2014); there are currently no studies, to this author's knowledge, relating the educational environment to appraisals of control and value, or achievement emotions, something that would tend to complete the paradigmatic picture from environment to achievement emotions to outcomes; Artino, Holmboe and Durning (2012b) recognized this gap

in medical education knowledge, and suggested a “call to action” (pg. 243) to medical education researchers to investigate this area.

Such an investigation has not been previously reported and is the subject of the current research.

Chapter 4 – Methodology

4.0 Setting and Context

The study setting was a small college of chiropractic medicine in an American university. The university is a private not-for-profit university regionally accredited by the Southern Association of Colleges and Schools. It has approximately 19,000 students on multiple campuses within the United States as well as two international campuses. The college of chiropractic medicine offers the Doctor of Chiropractic degree following a 3.5-year program of study. In the U.S., this is considered a graduate degree program (sometimes referred to as an entry level doctorate program), whereas chiropractic education in the UK, like allopathic medical education, is considered an undergraduate course of studies. Admission to the U.S. program is typical for Doctor of Chiropractic programs, requiring an undergraduate degree with a focus on the life and physical sciences (although exceptional students may be admitted with 90 credits, or three-years of their undergraduate degree; these students complete their undergraduate degree during their first year in the chiropractic program). The chiropractic program at this university is new, having admitted its first students in 2016. Three small cohorts of 12-15 students are admitted each year. The program sought and received programmatic accreditation from the Council on Chiropractic Education (CCE), the federally recognized accrediting agency for chiropractic education.

In terms of the context of this research, it is also noted that the researcher is also the dean of the college, and therefore has knowledge of the research participants. This is acknowledged in the limitations section of the Conclusion (Chapter 7) in terms of the possible influence of the power differential inherent in this relationship. The impact of the researcher's role was

minimized through reflexive consideration of this relationship as well as the professional conduct of both the researcher and participants during the qualitative data collection.

4.1 Study Design and Methodology

This research focuses on the relationship between perceptions of the educational environment and subjective appraisals of control and value, in a phenomenological context, that is, in terms of an inquiry into the experience of students. The study population presented a secondary opportunity to investigate differences in the perceptions of first- and second-year students so these data were also segregated for analysis. The collection of relevant data was enhanced by using validated instruments to measure these three variables (educational environment, subjective appraisal of control, and subjective appraisal of value), however, quantitative data, as validated as instruments may be, do not necessarily tell the whole story and qualitative data obtained from interviews are able to enrich the inquiry. Interviews, while time consuming in terms of analysis, have been termed the "heartland of social research" (Tight, 2012, p. 185) and accordingly this research follows the triangulation method of a mixed methods design (Creswell & Plano Clark, 2011). So-called triangulation is metaphorical for the relationship of three corners of a triangle: the subject matter, qualitative data, and quantitative data, each element of which bears a relationship to the other two elements.

4.2 Participants

The participant population is 64 first year and second year chiropractic medical students at the previously described American university.

The population of students is approximately 60% male and 40% female, with an average age of 34.3 years old. The students generally are either traditional pre-medical students who are younger and who have recently completed their undergraduate degrees with good academic

records; or, older students who are transitioning into a new career. This latter group usually comes from other health professions (e.g. dental hygiene, radiography technology, nursing) and is typically highly motivated to succeed, as they have committed considerable resources, financially and personally, into their chosen career.

These chiropractic medical students are in a scientifically rigorous academic program and tend to be supportive of research efforts at the university. Participation was entirely voluntary, and participants agreed to consent to participate before being provided access to the quantitative instrument, via Survey Monkey. All collected information on the quantitative instrument was anonymous except for basic demographic information identifying gender and age.

4.3 Quantitative Data Collection and Analysis

4.3.1 General context

Quantitative data were collected by administration of the Dundee Ready Educational Environment Measure (DREEM; Roff et al.,1997), and two 5-item instruments to measure cognitive appraisals of control and value (Hall *et al*, 2016). The combined 60-item instrument was made available to the student volunteers through a link to Survey Monkey. The quantitative data were subjected to correlation analysis to explore the relationship of any of the items or subscales within this pool of 60 questions (all items are Likert-type questions).

4.3.2 Data collection instruments

Roff et al. (1997) developed an instrument to measure the educational environment in five categories, or subscales, as described above. This instrument contains 50 items, each scored from 0 to 4, and is relatively easy to use and score. It was created by a team from five different countries (representing three continents) and it has been validated by numerous researchers (Roff, 2005). Denz-Penhey and Murdoch (2009) compared findings from the DREEM

instrument and from qualitative interviews and showed that there was consistency in the findings even when a very small number of students (as low as 3) completed the quantitative instrument. Other than a 2014 study of veterinary students (Pelzer, Hodgson, & Were, 2014), DREEM does not appear to have been used to measure the medical or chiropractic educational environment within the USA, even though there are no ethical, cultural, linguistic, political or economic reasons why it cannot be used here.

Hall et al. (2016) used a 5-item scale from Eccles and Wigfield (1995) to measure students' perception of value, as part of a study investigating the mediational roles of control and value on achievement emotions. To measure subjective appraisal of control, they used a 5-item subscale of the Primary Academic Control Scale, developed by Perry et al. (2001).

Data from these three instruments, that is, DREEM (Roff et al, 1997) and the two 5-item instruments described by Hall et al. (2016) were subjected to correlation analysis to explore the relationship of any of the items within this pool of questions. The qualitative data were collected and thematically analyzed before the quantitative data were analyzed. Triangulation is broadly defined as the combination of methodologies in the study of the same phenomenon (Jick,1979) and Creswell and Plano Clark (2011) do not explicitly advise mixing quantitative and qualitative data in any particular pattern. While it was appreciated that the purpose of triangulation is not necessarily to cross-validate data but also to capture different dimensions of the same phenomenon, it was decided that the qualitative data would be collected with as little cueing and bias as possible (in contrast to the grounded theory methodology in which the qualitative data collection would be guided by both quantitative results and progressive qualitative data collection).

A large questionnaire was created by combining the items of these three instruments, with minor modifications as necessary to fit the specific context and subjects of the research. The use of these validated instruments satisfies the quality criteria of internal validity and external validity in quantitative research (Frambach, van der Vleuten, & Durning, 2013). Cronbach's alpha coefficients for each of the instruments and sub-scales were calculated to further support internal validity.

Reliability, or the extent to which the results would be consistent in a replicated study, would require further study in similar chiropractic educational contexts. Objectivity was achieved by the avoidance of collection of personally identifying information, thereby providing students with a guarantee of confidentiality. To the extent possible, the data collected from the three sub-instruments were compared to the results from the administration of these instruments in other contexts. Indeed, this is commonly done with the DREEM to compare medical education environments around the world.

IBM SPSS Version 25 was used to seek the strength of relationships between the various subscales and elements of the instruments. These are reported through correlation analysis to estimate the relationships among sets of variables. This quantitative part of the mixed methods research was descriptive and not inferential; therefore, it sought to discover relationships among these measured elements rather than attempting to predict future events.

4.4 Qualitative Data Collection and Analysis

Qualitative data were collected from semi-structured interviews with the first six students who responded to an invitation to volunteer for a short interview (approximately but not exceeding 30 minutes). The qualitative portion of the research follows the general methodology of Palmgren and Laksov (2015) who, using focus groups, posed questions related to the five

domains of the DREEM to stimulate dialogue among a sample of chiropractic medical students. The current study did not seek clarification of the five domains of the DREEM which was the focus of the Palmgren and Laksov study. Instead, the current study seeks clarification of the students' perceptions of the relationship between the educational environment and the cognitive appraisals of control and value. Therefore, the following four questions were used to facilitate and stimulate dialogue during the interviews:

1. How do you understand the term "educational environment"?

2. How does the educational environment affect your learning process?

3. Tell me about your perception of control over your academic performance.

4. Describe the value you place on your professional education.

Upon posing these facilitatory questions, elaboration was provided, as necessary, to ensure that the participants understood the questions, and as the participants responded, probing questions were used to elicit more detail and a richer narrative.

After these four facilitatory questions, participants were asked if they wished to make any summary comments. First-hand notes were taken during each of the interviews with participants validating the nature of their comments as the interviews progressed. The interviews were also recorded for transcription and subjected to thematic analysis to extract categories and sub-categories common to the participant population. Following the advice of Chenail (2012), who stated that "although we may read a document word-by-word or line-by-line" (p. 266), we need to keep in mind the importance of, and focus on "meaningful, undivided entities and wholes as our units of analysis" (p.266), the comments of the six participants were also considered holistically in consideration of their overall themes.

The six participants included two first-year students and four second-year students. For clarity in the results and discussion chapters, these have been provided gender-appropriate pseudonyms as follows:

Year 1: Sally, Tom

Year 2: Jane, Mary, Sarah, Dave

Credibility (the extent to which the study's findings are trustworthy and believable to others), as a criterion of quality in qualitative research, was enhanced by the triangulation of data from multiple sources and through the process of member checking, which was done on multiple times during each interview by repeating the participants' words and asking for validation or correction of the sentence or phrase recorded. Transferability (the extent to which the findings can be transferred or applied in different settings) was addressed through a thorough description of the context within which the research was being conducted, that is, a small cohort of beginning chiropractic medical students in a new educational program. Dependability (the extent to which the findings are consistent in relation to the contexts in which they were generated) was assumed by the fact that virtually all possible participants were able to participate in the research. As subjective data were collected, they were able to be used to inform further data collection, in an iterative manner. Finally, confirmability (the extent to which the findings are based on the study's participants instead of the researcher's bias) was addressed through peer de-briefing during the data collection and analysis phases of the research (Frambach, van der Vleuten, & Durning, 2013).

Perhaps the greatest challenge in qualitative research is the fact that the researcher is inevitably inserted into the research process – along with his or her biases, beliefs and assumptions. This is necessarily unavoidable in this intimate form of social science research, but

its effects can be minimized by critical reflexivity, a vital skill for practitioner-researchers (Bleakely, 1999). This process begins with reflection on how personal beliefs and assumptions may influence the collected data, and in turn, how the collected data may influence the researcher. Qualitative inquiry does not demand random sampling, but randomization was sought in this study to minimize the possible bias of the researcher, who was known to all the research subjects. This was accomplished by having students volunteer to be interviewees. The qualitative inquiry facilitatory questions steered the participants towards the target subject matter but, to the extent possible, remained open-ended and welcoming of all comments and responses. Regardless of the researcher's reflexive stance, the possibility of unwanted influence on the research process cannot be discounted, particularly given the fact that the researcher had necessarily interacted with the participants during their course of studies, as a teacher and administrator.

4.5 Experimental Procedure and Ethical Considerations

Information about the study was sent via email to all students in the chiropractic program during the summer of 2018 (note – at that time, only first and second year students were enrolled in the new program). Along with the information was a link to the quantitative instrument which was designed using Survey Monkey. Students who clicked on the link were taken to another informational page and a consent page. Those clicking on the affirmative consent button were provided access to the instrument. At the conclusion of the 60-question survey, participants were asked if they were willing to volunteer for a 30-minute interview about the research. Participants were asked to email the researcher if they were interested in volunteering for the interview. Emailing the researcher was assumed to imply consent to the interview, but this was confirmed in person (verbally) prior to the actual interview. All quantitative data was anonymous except

for age (categories, not actual age), gender, and year of study. Identification was unavoidable at the interview, but confidentiality was assured, and the recordings and transcripts only identified participants as "participant 1, participant 2, etc." (for the purposes of the discussion section, participants were given aliases, e.g. Tom, first year student; Mary, second-year student). Prior to the commencement of the data collection, ethics board approval was sought and received from both the University of Liverpool and the researcher's home university. The letters of ethics approval from the University of Liverpool and the researcher's home university are provided in Appendices 2 and 3, respectively. Appendix 4 provides the Participant Information Sheet.

Chapter 5 – Results

5.0 Quantitative Data - descriptive statistics

Forty-seven of a total study population of sixty-four students completed the web-based survey instrument (73.4% response rate). Four of these respondents did not complete the instrument so 43 valid responses were returned and analyzed (67.2% of study population). The distribution of respondents in the six cohorts is shown in Table 5-1 (semester 1-3 students are first year students; semester 4-6 students are second year students).

Table 5-1 Current Semester of Respondents

	n	Percentage
First Semester	10	23.3
Second Semester	8	18.6
Third Semester	9	20.9
Fourth Semester	5	11.6
Fifth Semester	7	16.3
Sixth Semester	4	9.3
Total	43	100.0

The gender, age, ethnicity and pre-chiropractic background of the respondents is shown in Tables 5-2, 5-3, 5-4, and 5-5 respectively.

Table 5-2 Gender of Respondents

	n	Percentage
Female	18	41.9
Male	25	58.1
Total	43	100.0

Table 5-3 Age of Respondents

	n	Percentage
Under 30	19	44.2
31-40	15	34.9
Over 40	9	20.9
Total	43	100.0

Table 5-4 Ethnicity of Respondents

	n	Percentage
Hispanic	12	27.9
African American	5	11.6
Neither Hispanic nor African American	26	60.5
Total	43	100.0

Table 5-5 Pre-chiropractic Background of Respondents

	n	Percentage
BS/BA or higher	42	97.7
no degree, or associate degree	1	2.3
Total	43	100.0

The survey response data was analyzed by crosstabs using the Chi-square test to determine if there were any significant differences between the six cohorts of students. Table 5-6 shows the crosstab analysis by cohort of study and age of the respondents. Tables 5-7, 5-8, and 5-9 show the crosstab analysis by cohort of study and ethnicity, pre-chiropractic background and gender (respectively) of the respondents. There were no significant differences between the cohorts with respect to age distribution, or ethnicity, or pre-chiropractic background. Table 5-9 indicates a significant difference between the cohorts regarding gender ($p = .023$). The data show a higher proportion of male respondents in the first semester of study and a higher proportion of female respondents in the third semester of study, with the other semesters showing closer to equal

proportions of male and female respondents. This was considered an artifact due to the population differences in these cohorts, with unequal numbers of male and female students, and it was assumed that this artifactual difference, though statistically significant, would not influence the results related to the survey responses.

Table 5-6 Crosstab Analysis of Cohort of Study and Age of Respondents

		Current semester of study:					
AGE		First Semester	Second Semester	Third Semester	Fourth Semester	Fifth Semester	Sixth Semester
Under 30	% of Total	9.3%	11.6%	9.3%	2.3%	7.0%	4.7%
31-40	% of Total	4.7%	4.7%	7.0%	4.7%	9.3%	4.7%
Over 40	% of Total	9.3%	2.3%	4.7%	4.7%	0.0%	0.0%
TOTAL	% of Total	23.3%	18.6%	20.9%	11.6%	16.3%	9.3%

$\chi(10) = 8.689$, $p = 0.562$ There are no significant differences among the cohorts of study in terms of age of the students

Table 5-7 Crosstab Analysis of Cohort of Study and Ethnicity of Respondents

			Current semester of study:						
ETHNICITY			First Semester	Second Semester	Third Semester	Fourth Semester	Fifth Semester	Sixth Semester	Total
	Hispanic	% of Total	7.0%	7.0%	7.0%	4.7%	2.3%	0.0%	27.9%
	African-American	% of Total	4.7%	0.0%	2.3%	0.0%	4.7%	0.0%	11.6%
	Neither Hispanic nor African-American	% of Total	11.6%	11.6%	11.6%	7.0%	9.3%	9.3%	60.5%
TOTAL		% of Total	23.3%	18.6%	20.9%	11.6%	16.3%	9.3%	100.0%

$\chi(10) = 7.797$, $p = 0.649$ There are no significant differences among the cohorts of study in terms of ethnicity of the students

Table 5-8 Crosstab Analysis of Cohort of Study and Pre-Chiropractic Background of Respondents

PRE-CHIROPRACTIC BACKGROUND			Current semester of study: First Semester	Second Semester	Third Semester	Fourth Semester	Fifth Semester	Sixth Semester	Total
	BS/BA or higher	% of Total	23.3%	16.3%	20.9%	11.6%	16.3%	9.3%	97.7%
	No degree	% of Total	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%	2.3%
TOTAL		% of Total	23.3%	18.6%	20.9%	11.6%	16.3%	9.3%	100.0%

χ (5) = 4.479, p = 0.483 There are no significant differences among the cohorts of study in terms of pre-chiropractic background of the students (that is, academic preparation prior to acceptance into chiropractic school)

Table 5-9 Crosstab Analysis of Cohort of Study and Gender of Respondents

GENDER		Current semester of study: First Semester	Second Semester	Third Semester	Fourth Semester	Fifth Semester	Sixth Semester	Total
Female	% of Total	4.7%	7.0%	18.6%	4.7%	7.0%	0.0%	41.9%
Male	% of Total	18.6%	11.6%	2.3%	7.0%	9.3%	9.3%	58.1%
TOTAL	% of Total	23.3%	18.6%	20.9%	11.6%	16.3%	9.3%	100.0%

χ (5) = 13.095, p = 0.023 There are significant differences among the cohorts of study in terms of gender of the students. The possible reasons for this are discussed in Chapter 6.

5.1 Reliability of the Instrument Sub-Scales

Cronbach's alpha, representing the coefficient of internal reliability of the five subscales of DREEM and the two 5-item subscales measuring perception of control and value are shown in Table 5-10. These are all over 0.70 which is generally considered acceptable in social science research (Cortina, 1993). Over 0.8 is considered good reliability and over 0.9 is considered

excellent reliability. This is a measure of the intercorrelations of the various survey items. The higher the alpha, the lower the variance of scores within that survey population.

Table 5-10 Cronbach's Alpha for Survey Sub-Scales

Subscale	Number of items	Scale Statistics		Cronbach's Alpha
		Mean	Standard deviation	
DREEM – Perception of Learning	12	51.60	7.122	0.884
DREEM – Perception of Teaching	11	46.44	7.258	0.853
DREEM – Academic Self-Perception	8	34.60	5.434	0.863
DREEM – Perception of Atmosphere	12	50.51	9.845	0.915
DREEM – Social Self-Perception	7	26.67	5.432	0.745
Perception of Control	5	21.26	3.928	0.763
Perception of Value	5	6.00	1.690	0.851

5.2 DREEM scores and sub-scores

The DREEM instrument consists of fifty questions related to five different dimensions of the educational environment (Roff et al, 1997). A 5-pont Likert type scale was used (1: strongly disagree – 5: strongly agree). The subscales and their maximum scores are as follows:

Perception of Learning – 12 items, maximum score 60

Perception of Teaching – 11 items, maximum score 55

Academic Self-Perception – 8 items, maximum score 50

Perception of Atmosphere – 12 items, maximum score 60

Social Self-Perception – 7 items, maximum score 35

The instrument was used as presented by Roff et al. (1997) with minor modifications of some questions to better fit the context of chiropractic medical education. These modifications were as follows:

- Question 14, "The teachers have good communication skills with patients" was replaced with "The teachers have good communication skills", because at the time of the survey, the program had not yet progressed to the clinical stage where students could observe faculty members with patients
- Question 22, "The teachers are patient with patients" was replaced with "The teachers are patient", for the same reasons as given above
- Question 25, "Much of what I have to learn seems relevant to a career in medicine" was modified by adding the word "chiropractic" (i.e. "chiropractic medicine")
- Question 27, "Last year's work has been good preparation for this year's work" was replaced with "Last semester's work has been good preparation for this semester's work" because all students were either in their first or second year of study. The point of the items was previous preparation in the program, irrespective of "year" or "semester", so this minor change was considered non-substantive
- Question 29, "I am confident about passing this year" was replaced with "I am confident about passing this semester", for the reasons given above
- Question 36, "The atmosphere is relaxed during seminars/tutorials" should have been left in that form but by mistake it was changed to "The atmosphere is relaxed during lectures" (i.e. the same as question 32). The classes in the chiropractic program are very small (averaging 10-15 students) and the faculty have considerable interaction in each session, so that there is barely a distinction between "lecture" and "seminar/tutorial" in this

program. Therefore, when this mistake was noticed (after data collection) it was determined to leave the question as it was.

- Question 37, "The enjoyment outweighs the stress of studying medicine" was modified by adding the word "chiropractic" (i.e. "chiropractic medicine")
- Question 40. "The atmosphere is relaxed during the ward teaching" was replaced with "The atmosphere is relaxed during seminars and labs" because the students had not yet been exposed to the clinical environment, but instead, at their stage of the program, they had experienced simulated clinical environments in what was called "labs"
- Question 46, "I am too tired to enjoy this course" was replaced with "I am too tired to enjoy this program". The original DREEM survey referred to the medical program as a "course" whereas in the program at the researcher's home university, a course refers to an individual subject study, and the overall degree program is referred to as a "program"
- Question 47, I am rarely bored on (sic) this course" was changed to "I am rarely bored in this program"

Several questions are written in the negative and were scored negatively as intended by Roff et al (1997). The survey (DREEM questions as well as the questions related to Control and Value) is provided in the Appendix.

The DREEM instrument is constructed in such a way that higher scores generally indicate a more positive environment. The five subscales (items and scores) are shown in Tables 5-11, 5-12, 5-13, 5-14, and 5-15. A summary of the subscale total scores is shown in Table 5-16.

Table 5-11 Subscale items and scores for Perception of Learning

	Mean	Std. Deviation
I am encouraged to participate in class	4.6	0.9
The teaching is sufficiently concerned to develop my confidence	4.5	0.8
The teaching encourages me to be an active learner	4.6	0.8
The teaching is well focused	4.4	0.7
The teaching is sufficiently concerned to develop my competence	4.6	0.8
I am clear about the learning objectives of the courses	4.6	0.6
The teaching is often stimulating	4.5	0.8
The teaching time is put to good use	4.4	0.8
The teaching is student centered	4.5	0.9
Long-term learning is emphasized over short term	4.5	0.9
The teaching is too teacher-centered	2.5	1.3
The teaching over-emphasizes factual learning	3.0	1.3

Table 5-12 Subscale items and scores for Perception of Teaching

	Mean	Std. Deviation
The teachers are good at providing feedback to students	4.6	0.7
The teachers have good communications skills	4.5	0.9
The teachers are knowledgeable	4.9	0.4
The teachers give clear examples	4.6	0.9
The teachers are well prepared for their classes	4.8	0.7
The teachers provide constructive criticism here	4.5	1.0
The teachers ridicule the students	1.9	1.3
The teachers get angry in class	2.2	1.3
The teachers are authoritarian	2.6	1.4
The teachers are patient	4.4	0.9
The students irritate the teachers	3.0	1.4

Table 5-13 Subscale items and scores for Academic Self-Perception

	Mean	Std. Deviation
I am able to memorize all I need	3.3	1.2
Much of what I have to learn seems relevant to a career in chiropractic medicine	4.5	0.8
I feel I am being well prepared for my profession	4.7	0.7
Last semester's work has been a good preparation for this semester's work	4.4	1.0
My problem-solving skills are being well developed here	4.6	0.7
I am confident about passing this semester	4.6	0.7
I have learned a lot about empathy in my profession	4.4	1.1
Learning strategies which worked for me before continue to work for me now	4.1	1.2

Table 5-14 Subscale items and scores for Perception of Atmosphere

	Mean	Std. Deviation
The atmosphere is relaxed during lectures	4.2	1.0
I feel able to ask the questions I want	4.3	1.2
I feel comfortable in class socially	4.3	1.1
There are opportunities for me to develop interpersonal skills	4.4	1.0
The atmosphere is relaxed during lectures	4.2	1.2
The enjoyment outweighs the stress of studying chiropractic medicine	3.8	1.2
The atmosphere motivates me as a learner	4.3	1.0
I am able to concentrate well	4.1	1.0
The atmosphere is relaxed during seminars and labs	4.3	1.0
The school is well timetabled	4.1	1.3
I find the experience disappointing	1.8	1.2
Cheating is a problem in this school	1.8	1.4

Table 5-15 Subscale items and scores for Social Self-Perception

	Mean	Std. Deviation
I have good friends in this school	4.3	1.1
There is a good support system for students who get stressed	3.6	1.4
I am too tired to enjoy this program	2.5	1.3
I am rarely bored in this program	3.7	1.3
My accommodation is pleasant	4.1	1.2
My social life is good	3.9	1.1
I seldom feel lonely	3.7	1.3

Table 5-16 Summary of DREEM subscale scores for all participants

DREEM Subscale	Total Score
Perception of Learning	50.55 (out of 60)
Perception of Teaching	41.89 (out of 55)
Academic Self-Perception	34.60 (out of 40)
Perception of Atmosphere	45.68 (out of 60)
Social Self-Perception	25.61 (out of 35)
OVERALL DREEM SCORE	198.33 (out of 250)

Total DREEM scores have been considered a general measure of the "goodness" of a medical educational environment. The four quartiles have been described as "very poor', "plenty of problems", "more positive than negative", and "excellent" (Luciani, et al, 2015). The

score of 198.33 is placed in the highest quartile (187.5-250) and hence would indicate an overall "excellent" educational environment. Caution is suggested, however, in interpreting the results this way, as was discussed in the literature review chapter. The issue is that the 50-item DREEM is not unidimensional and overall scores may be misleading if subscale scores are widely divergent (Vaughan, Mulcahy & McLaughlin, 2014). These authors suggest that subscale scores may be still be useful in comparing institutions or the same institution over time. Having said this, the instrument continues to be used by authors reporting the overall score as an evaluation of the overall educational environment (Wong et al., 2015; Pelzer, Hodgson & Were, 2014). In response to this criticism of the interpretation of the DREEM, its original authors defend its utility by suggesting that more than 200 DREEM studies have "all report(ed) robust psychometrics" (Roff & McAleer, 2015, p. 698).

In any case, the overall score is simply reported as what would be considered an "excellent" environment by the authors of DREEM. This current study, however, is not concerned with the quality of the environment, but rather the influence of any of the environmental elements on students' cognitive appraisal of control or value.

5.3 Perceptions of Control and Value scores

The students' perception and appraisal of value (of their education) and control (over their educational process) were measured with two 5-item Likert-type scales (1: strongly agree – 5: strongly disagree) previously described and validated for this purpose (Hall et al., 2016). The items and scores for these two scales are shown in Tables 5-17 and 5-18. Hall et al. reported Cronbach's alpha for these two instruments as 0.79 (M = 5.35, SD = 1.03) and 0.86 (M = 5.63, SD = 1.10) respectively (Hall et al., 2016, p. 319), which were like those reported herein, 0.763

and 0.851 respectively. Note that in Hall's original study, the Likert-type scale was from 1 to 7, not 1-5 as in the current study.

Table 5-17 Students' appraisals of control

	Mean	Std. Deviation
I have a great deal of control over my academic performance in my courses	4.3	1.1
The more effort I put into my courses, the better I do in them	4.5	1.1
I see myself as largely responsible for my performance throughout my college career	4.7	.6
When I do poorly in my courses, it is usually because I haven't given it my best effort	3.6	1.4
My grades are basically determined by things beyond my control and there is little I can do to change that	1.9	1.2

Table 5-18 Students' perception of value

	Mean	Std. Deviation
How important is the process of learning to you?	1.1	.3
I feel that, to me, doing well in my studies is…	1.1	.3
How important is it for you to get good grades?	1.2	.5
Compared to most of your other activities, how important is it for you to perform well academically?	1.3	.4
How useful is doing well at school to your future career as a chiropractic physician?	1.3	.6

5.4 Comparison of results from students in Year 1 and in Year 2

Group statistics were compiled using the t-test to identify any significant differences in the responses of each item when comparing students in Year 1 and students in Year 2. Simple t-test analysis of the data from Year 1 and Year 2 students did not reveal any significant differences. However, Levene's Test for Equality of Variance (Gastworth, Gel & Miao, 2009) reveals some items with significant differences from Year 1 to Year 2. Specifically, these included three items from the DREEM instrument, one from the Perception of Control instrument, and all five items on the Perception of Value instrument (Tables 5-19, 5-20, and 5-21).

Two related items on the DREEM instrument in the Perception of Teaching subscale, "The teachers are well prepared for their classes" and "The teachers provide constructive criticism here" showed significant differences from Year 1 to Year 2 ($p = .001$ and $p = .01$ respectively). In both cases the scores were lower for Year 2 students, and this is thought to be an artifact related to an issue that the cohort was having with one of their professors. It cannot be confirmed from the data whether or not this would skew the results in other areas, but this does not seem to the case, at least from the results of the Levene Test. This specific cohort effect may also be responsible for the third significant difference, which was question 38 in the Perception of Atmosphere subscale, "The atmosphere motivates me as a learner" ($p = 0.25$). Other items in the Perception of Atmosphere subscale show no significant differences in Year 1 and Year 2 students.

One item in the Perception of Control scale showed a significant difference between Year 1 and Year 2 students, "I see myself as largely responsible for my performance throughout my college career" ($p = .016$). In this case, the Year 1 students scored lower than Year 2

students, suggesting that the latter student group sees themselves are more responsible for their academic performance. Other items in the Perception of Control scale did not show significant differences and it is difficult to assess the importance or meaning of this isolated result. The qualitative results did not reveal such a difference in the perception of the Year 1 and Year 2 students, however this was based on only six interviews.

All five items on the Perception of Value scale showed significant differences between Year 1 and Year 2 students. In all cases, the Year 2 students scored higher than Year 1 students (which in the context of the scoring of these items, indicates lower levels of cognitive appraisal of value). The levels of significance (shown in Table 5-21) were robust, ranging from .000 to .032. Clearly the Year 1 students indicated a greater overall perception of value on their studies in chiropractic medicine. A further study into this phenomenon would be valuable to determine if this is related to simple cohort characteristics, or if it represents an decrease in the perception of value as students pass through the curriculum. Pekrun (2006) viewed "value" as both intrinsic (i.e. as in studying a field for its own sake) and extrinsic (i.e. as in valuing education for the attainment of recognition) but he considered it as an integrated, or single measure in the Control-Value Theory. Battle and Wigfield (2003) assert that the perception of value is important in determining one's decision to engage in a field. Such as assumption would suggest that as students pass through the chiropractic program, they may lower the value of their decision to become chiropractic physicians.

Table 5-19 Levene's Test of Equality of Variance – DREEM scores per year of study (t-test for significance)

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
I am encouraged to participate in class	Equal variances assumed	.152	.699	-.473	41	.639
	Equal variances not assumed			-.445	26.068	.660
The teaching is sufficiently concerned to develop my confidence	Equal variances assumed	.393	.534	-.713	41	.480
	Equal variances not assumed			-.712	31.457	.482
The teaching encourages me to be an active learner	Equal variances assumed	.136	.714	-.026	41	.979
	Equal variances not assumed			-.024	23.268	.981
The teaching is well focused	Equal variances assumed	.349	.558	-.142	41	.888
	Equal variances not assumed			-.146	34.174	.885
The teaching is sufficiently concerned to develop my competence	Equal variances assumed	.676	.416	-.028	41	.977
	Equal variances not assumed			-.025	20.683	.980
I am clear about the learning objectives of the courses	Equal variances assumed	3.482	.069	1.165	41	.251
	Equal variances not assumed			1.025	21.308	.317
The teaching is often stimulating	Equal variances assumed	.188	.667	-.211	41	.834
	Equal variances not assumed			-.191	23.236	.850
The teaching time is put to good use	Equal variances assumed	.530	.471	1.239	41	.222
	Equal variances not assumed			1.241	31.738	.224
The teaching is student centered	Equal variances assumed	.806	.375	.156	41	.877
	Equal variances not assumed			.142	23.541	.888
Long-term learning is emphasized over short term	Equal variances assumed	.109	.743	.197	41	.845
	Equal variances not assumed			.185	25.705	.855

The teaching is too teacher-centered	Equal variances assumed	.049	.825	-.380	41	.706
	Equal variances not assumed			-.372	29.394	.713
The teaching over-emphasizes factual learning	Equal variances assumed	.034	.855	1.229	41	.226
	Equal variances not assumed			1.243	32.691	.223
The teachers are good at providing feedback to students	Equal variances assumed	.661	.421	.584	41	.562
	Equal variances not assumed			.546	25.590	.590
The teachers have good communications skills	Equal variances assumed	2.464	.124	.536	41	.595
	Equal variances not assumed			.469	20.963	.644
The teachers are knowledgeable	Equal variances assumed	1.844	.182	.686	41	.496
	Equal variances not assumed			.647	26.204	.523
The teachers give clear examples	Equal variances assumed	.543	.465	.478	41	.635
	Equal variances not assumed			.439	24.258	.664
The teachers are well prepared for their classes	Equal variances assumed	12.754	.001	2.046	41	.047
	Equal variances not assumed			1.618	16.196	.125
The teachers provide constructive criticism here	Equal variances assumed	7.252	.010	.799	41	.429
	Equal variances not assumed			.675	19.058	.508
The teachers ridicule the students	Equal variances assumed	.741	.394	.771	41	.445
	Equal variances not assumed			.807	36.151	.425
The teachers get angry in class	Equal variances assumed	2.551	.118	1.521	41	.136
	Equal variances not assumed			1.622	37.803	.113
The teachers are authoritarian	Equal variances assumed	.029	.866	.365	41	.717
	Equal variances not assumed			.368	32.596	.715
The teachers are patient	Equal variances assumed	.501	.483	-1.069	41	.291
	Equal variances not assumed			-1.073	31.940	.291
The students irritate the teachers	Equal variances assumed	.005	.945	-2.107	41	.041
	Equal variances not assumed			-2.069	29.894	.047
I am able to memorize all I need	Equal variances assumed	2.266	.140	-1.869	41	.069

	Equal variances not assumed			-1.962	36.429	.057
Much of what I have to learn seems relevant to a career in chiropractic medicine	Equal variances assumed	.325	.571	-.687	41	.496
	Equal variances not assumed			-.696	32.925	.491
I feel I am being well prepared for my profession	Equal variances assumed	.009	.925	-.264	41	.793
	Equal variances not assumed			-.249	26.176	.805
Last semester's work has been a good preparation for this semester's work	Equal variances assumed	3.487	.069	-1.286	41	.206
	Equal variances not assumed			-1.344	36.006	.187
My problem-solving skills are being well developed here	Equal variances assumed	.198	.659	-.411	41	.683
	Equal variances not assumed			-.397	28.329	.694
I am confident about passing this semester	Equal variances assumed	2.871	.098	-1.008	41	.320
	Equal variances not assumed			-1.095	39.292	.280
I have learned a lot about empathy in my profession	Equal variances assumed	.137	.713	-.573	41	.569
	Equal variances not assumed			-.580	32.832	.566
Learning strategies which worked for me before continue to work for me now	Equal variances assumed	.133	.717	-.945	41	.350
	Equal variances not assumed			-.937	30.856	.356
The atmosphere is relaxed during lectures	Equal variances assumed	.064	.801	.601	41	.551
	Equal variances not assumed			.567	26.330	.575
I feel able to ask the questions I want	Equal variances assumed	2.420	.127	-.887	41	.380
	Equal variances not assumed			-.944	37.601	.351
I feel comfortable in class socially	Equal variances assumed	.565	.457	.638	41	.527
	Equal variances not assumed			.607	27.025	.549
There are opportunities for me to develop interpersonal skills	Equal variances assumed	2.237	.142	1.285	41	.206
	Equal variances not assumed			1.120	20.739	.276
	Equal variances assumed	.021	.886	.904	41	.371

The atmosphere is relaxed during lectures	Equal variances not assumed			.891	30.178	.380
The enjoyment outweighs the stress of studying chiropractic medicine	Equal variances assumed	3.920	.054	.579	41	.566
	Equal variances not assumed			.523	22.983	.606
The atmosphere motivates me as a learner	Equal variances assumed	5.427	.025	1.848	41	.072
	Equal variances not assumed			1.576	19.499	.131
I am able to concentrate well	Equal variances assumed	.066	.798	.467	41	.643
	Equal variances not assumed			.439	25.980	.664
The atmosphere is relaxed during seminars and labs	Equal variances assumed	.830	.368	1.508	41	.139
	Equal variances not assumed			1.368	23.316	.184
The school is well timetabled	Equal variances assumed	.351	.557	1.071	41	.290
	Equal variances not assumed			1.037	28.562	.308
I find the experience disappointing	Equal variances assumed	1.051	.311	-1.161	41	.252
	Equal variances not assumed			-1.079	25.088	.291
Cheating is a problem in this school	Equal variances assumed	.623	.434	-.738	41	.465
	Equal variances not assumed			-.722	29.563	.476
I have good friends in this school	Equal variances assumed	.245	.623	.027	41	.979
	Equal variances not assumed			.028	34.790	.978
There is a good support system for students who get stressed	Equal variances assumed	2.053	.159	1.910	41	.063
	Equal variances not assumed			2.024	37.251	.050
I am too tired to enjoy this program	Equal variances assumed	1.122	.296	-.285	41	.777
	Equal variances not assumed			-.276	28.608	.784
I am rarely bored in this program	Equal variances assumed	.078	.781	.513	41	.611
	Equal variances not assumed			.515	32.118	.610
My accommodation is pleasant	Equal variances assumed	.764	.387	1.696	41	.097
	Equal variances not assumed			1.597	26.130	.122

My social life is good	Equal variances assumed	.031	.861	-.542	41	.591
	Equal variances not assumed			-.539	31.164	.593
I seldom feel lonely	Equal variances assumed	1.623	.210	-1.323	41	.193
	Equal variances not assumed			-1.396	36.908	.171

Table 5-20 Levene's Test of Equality of Variance – Perception of Control scores per year of study

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
I have a great deal of control over my academic performance in my courses	Equal variances assumed	.718	.402	-.697	41	.490
	Equal variances not assumed			-.713	33.963	.481
The more effort I put into my courses, the better I do in them	Equal variances assumed	.103	.750	-.162	41	.872
	Equal variances not assumed			-.161	31.414	.873
I see myself as largely responsible for my performance throughout my college career	Equal variances assumed	6.270	.016	-1.243	41	.221
	Equal variances not assumed			-1.475	39.234	.148
When I do poorly in my courses, it is usually because I haven't given it my best effort	Equal variances assumed	2.264	.140	1.215	41	.231
	Equal variances not assumed			1.161	27.366	.256
My grades are basically determined by things beyond my control and there is little I can do to change that	Equal variances assumed	.538	.468	-.330	41	.743
	Equal variances not assumed			-.317	27.972	.753

Table 5-21 Levene's Test of Equality of Variance – Perception of Value scores per year of study

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
How important is the process of learning to you?	Equal variances assumed	24.108	.000	-2.171	41	.036
	Equal variances not assumed			-1.808	18.345	.087
I feel that, to me, doing well in my studies is…	Equal variances assumed	4.946	.032	-1.084	41	.285
	Equal variances not assumed			-.945	20.751	.356
How important is it for you to get good grades?	Equal variances assumed	13.405	.001	-1.846	41	.072
	Equal variances not assumed			-1.584	19.846	.129
Compared to most of your other activities, how important is it for you to perform well academically?	Equal variances assumed	23.360	.000	-3.057	41	.004
	Equal variances not assumed			-2.718	21.959	.013
How useful is doing well at school to your future career as a chiropractic physician?	Equal variances assumed	13.814	.001	-2.596	41	.013
	Equal variances not assumed			-2.253	20.494	.035

5.5 Inter-item correlations and relationships

Correlation coefficients were calculated for each of the DREEM items (correlated) with the perceptions of control and value (per the main goal of the research). These are shown in Tables 5-22 to 5-31 (pages 105-114).

The magnitude of the data display does not permit the data from all DREEM subscales and both perception scales to be illustrated in a single table. Therefore, the correlation data are presented in a series of Tables, per the following chart:

DREEM Subscale	**Correlated with…**	
	Cognitive appraisal of Control	Cognitive appraisal of Value
Perception of Learning	Table 5-22	Table 5-23
Perception of Teaching	Table 5-24	Table 5-25
Academic self-perception	Table 5-26	Table 5-27
Perception of atmosphere	Table 5-28	Table 5-29
Social self-perception	Table 5-30	Table 5-31

Table 5-22 shows the correlation of items from the Perception of Learning subscale and items from the Perception of Control instrument (also referred to as the cognitive appraisal of control). Of the 60 cells in this table, 30 show significant correlations (50%). Specifically, three

of the elements of the control instrument contain all but three of these significant correlations. These three are: “I have a great deal of control over my academic performance in my courses”, The more effort I put into my courses, the better I do in them”, and “My grades are determined by things beyond my control and there is little I can do to change that”. The latter item is scored negatively, therefore nine of the ten significant correlations are negative correlations. The only item that is a positive correlation is “the teaching is too teacher centered”, a negative item in the DREEM Perception of Learning subscale; therefore, this apparent positive correlation is also effectively a negative correlation.

Table 5-24 shows the correlation of items from the Perception of Teaching subscale and items from the Perception of Control instrument. It too shows significant correlations in 34 of 55 cells (62%), with significant correlations distributed throughout the five items of the Perception of Control instrument. The double negative phenomenon occurs again with positive correlations of the negative control item (“My grades are basically determined…”) and the negative DREEM items (“the teachers ridicule the students”, “the teachers get angry in class”).

Table 5-26 shows the correlation of items from the Academic Self-Perception subscale and the Perception of Control instrument. It shows a very strong connection between these scales with 30 of 40 cells showing a significant correlation (75%). Similarly, Table 5-28 which shows the correlation of items from the Perception of Atmosphere subscale and the Perception of Control instrument has significant correlations in 41 of 60 cells (68%). Finally, Table 5-30 shows the correlation of items from the Social Self-Perception subscale and the Perception of Control instrument. In this table, 15 of 35 cells show significant correlations (43%). The significant correlations are generally distributed throughout the table without apparent pattern.

Table 5-23, showing correlation of items from the Perception of Learning subscale and the Perception of Value instrument, has only one significant cell (out of 60, or 2%). Table 5-25, showing correlation of items from the Perception of Teaching subscale and the Perception of Value has two significant correlations out of 55 cells (4%). Table 5-27, showing correlation of items from the Academic Self-Perception subscale and the Perception of Value, has no significant correlations (out of 40 cells). Table 5-29, showing the correlation of items from the Perception of Atmosphere subscale and the Perception of Value, has three significant correlations, out of 60 cells (5%). Finally, Table 5-31, showing the correlation of items from the Social Self-Perception subscale and the Perception of Value instrument, shows three significant correlations, out of 35 cells (9%).

Clearly, educational environment elements as included in the DREEM instrument are more likely to be correlated with the cognitive appraisal of control than the cognitive appraisal of value, at least in this small sample of chiropractic medical students. These relationships, shown in terms of the percentage of cells showing significant correlations can be visualized in the Figure 5-1.

Figure 5-1 Statistically significant correlation of DREEM subscales with Perception of Control and Value

Statistically significant correlations with cognitive appraisal of control	DREEM Subscale	Statistically significant correlations with cognitive appraisal of value
50%	Perception of Learning	2%
62%	Perception of Teaching	4%
75%	Academic Self-Perception	0%
68%	Perception of Atmosphere	5%
43%	Social Self-Perception	9%

Table 5-22 Correlation of items from DREEM Perception of Learning Subscale and Cognitive Appraisal of Control

DREEM Perception of Learning Subscale Items	r = Pearson Correlation p = Significance (2-tailed)	Cognitive Appraisal of Control				
		I have a great deal of control over my academic performance in my courses	The more effort I put into my courses, the better I do in them	I see myself as largely responsible for my performance throughout my college career	When I do poorly in my courses, it is usually because I haven't given it my best effort	My grades are basically determined by things beyond my control and there is little I can do to change that
I am encouraged to participate in class	r p	.522 .000	.376 .013	-.032 .838	.096 .541	-.335 .028
The teaching is sufficiently concerned to develop my confidence	r p	.393 .009	.243 .116	.291 .058	.177 .256	-.305 .047
The teaching encourages me to be an active learner	r p	.414 .006	.317 .038	-.014 .930	.168 .282	-.387 .010
The teaching is well focused	r p	.519 .000	.221 .154	-.056 .723	-.012 .939	-.354 .020
The teaching is sufficiently concerned to develop my competence	r p	.589 .000	.400 .008	.034 .826	.361 .018	-.444 .003
I am clear about the learning objectives of the courses	r p	.464 .002	.508 .001	-.062 .694	.095 .544	-.343 .025
The teaching is often stimulating	r p	.477 .001	.259 .093	-.019 .903	.153 .326	-.548 .000
The teaching time is put to good use	r p	.243 .116	.221 .155	.223 .150	.061 .696	-.236 .127
The teaching is student-centered	r p	.719 .000	.544 .000	.025 .874	.202 .193	-.537 .000
Long-term learning is emphasized over short-term	r p	.396 .009	.358 .018	.318 .038	.188 .228	-.458 .002
The teaching is too teacher centered	r p	-.461 .002	-.558 .000	-.278 .071	-.654 .000	.523 .000
The teaching over-emphasizes factual learning	r p	-.051 .746	-.017 .913	-.059 .709	.147 .348	-.032 .840

Table 5-23 Correlation of items from DREEM Perception of Learning Subscale and Cognitive Appraisal of Value

DREEM Perception of Learning Subscale Items	r = Pearson Correlation p = Significance (2-tailed)	Cognitive Appraisal of Value				
		How important is the process of learning to you?	I feel that, to me, doing well in my studies is…	How important is it for you to get good grades?	Compared to most of your other activities, how important is it for you to perform well academically?	How useful is doing well at school to your future career as a chiropractic physician?
I am encouraged to participate in class	r p	-.002 .990	-.191 .220	-.026 .870	.021 .891	-.240 .120
The teaching is sufficiently concerned to develop my confidence	r p	.041 .796	.054 .732	.153 .326	.228 .142	.017 .914
The teaching encourages me to be an active learner	r p	.019 .906	.036 .817	.122 .434	.187 .230	-.069 .660
The teaching is well focused	r p	-.010 .948	.104 .508	.095 .545	-.049 .754	-.080 .609
The teaching is sufficiently concerned to develop my competence	r p	.020 .898	.039 .802	.065 .678	.131 .402	-.075 .635
I am clear about the learning objectives of the courses	r p	-.106 .497	-.110 .483	.063 .690	-.034 .828	-.181 .246
The teaching is often stimulating	r p	.060 .703	.068 .667	-.012 .942	.123 .432	-.150 .338
The teaching time is put to good use	r p	-.083 .595	-.014 .928	.044 .779	-.007 .966	-.307 .045
The teaching is student-centered	r p	.056 .721	-.041 .792	-.127 .418	-.068 .664	-.235 .130
Long-term learning is emphasized over short-term	r p	-.056 .721	-.063 .687	.069 .662	.007 .964	-.190 .223
The teaching is too teacher centered	r p	-.133 .393	.044 .781	.033 .836	.037 .812	.066 .675
The teaching over-emphasizes factual learning	r p	-.227 .142	-.143 .360	-.119 .448	.000 1.000	-.129 .410

Table 5-24 Correlation of items from DREEM Perception of Teaching Subscale and Cognitive Appraisal of Control

DREEM Perception of Teaching Subscale Items	r = Pearson Correlation p = Significance (2-tailed)	Cognitive Appraisal of Control				
		I have a great deal of control over my academic performance in my courses	The more effort I put into my courses, the better I do in them	I see myself as largely responsible for my performance throughout my college career	When I do poorly in my courses, it is usually because if haven't given it my best effort	My grades are basically determined by things beyond my control and there is little I can do to change that
The teachers are good at providing feedback to students	r p	.291 .059	.297 .053	-.055 .724	.135 .389	-.395 .009
The teachers have good communications skills	r p	.457 .002	.470 .001	.101 .521	.315 .040	-.534 .000
The teachers are knowledgeable	r p	.505 .001	.491 .001	.143 .360	.220 .156	-.398 .008
The teachers give clear examples	r p	.290 .060	.347 .023	.354 .020	.353 .020	-.420 .005
The teachers are well prepared for their classes	r p	.495 .001	.570 .000	.012 .941	.222 .153	-.489 .001
The teachers provide constructive criticism here	r p	.411 .006	.269 .081	-.056 .722	.114 .466	-.323 .034
The teachers ridicule the students	r p	-.236 .128	-.435 .004	-.386 .010	-.335 .028	.350 .022
The teachers get angry in class	r p	-.607 .000	-.565 .000	-.297 .053	-.363 .017	.477 .001
The teachers are authoritarian	r p	-.322 .036	-.433 .004	-.363 .017	-.289 .060	.279 .070
The teachers are patient	r p	.423 .005	.382 .011	.440 .003	.300 .051	-.380 .012
The students irritate the teachers	r p	-.182 .244	-.375 .013	-.099 .529	-.364 .016	.251 .105

Table 5-25 Correlation of items from DREEM Perception of Teaching Subscale and Cognitive Appraisal of Value

DREEM Perception of Teaching Subscale Items	r = Pearson Correlation p = Significance (2-tailed)	Cognitive Appraisal of Value				
		How important is the process of learning to you?	I feel that, to me, doing well in my studies is…	How important is it for you to get good grades?	Compared to most of your other activities, how important is it for you to perform well academically?	How useful is doing well at school to your future career as a chiropractic physician?
The teachers are good at providing feedback to students	r p	-.095 .543	-.098 .530	-.017 .914	.047 .766	-.222 .153
The teachers have good communications skills	r p	-.135 .387	.040 .798	.010 .947	.066 .673	-.230 .138
The teachers are knowledgeable	r p	-.273 .077	-.153 .327	-.108 .489	-.072 .648	-.463 .002
The teachers give clear examples	r p	-.078 .618	.028 .860	-.074 .637	.038 .807	-.231 .137
The teachers are well prepared for their classes	r p	-.197 .205	-.041 .795	.007 .965	-.114 .468	-.335 .028
The teachers provide constructive criticism here	r p	.052 .743	.058 .711	.150 .338	.050 .752	-.172 .269
The teachers ridicule the students	r p	-.153 .327	-.130 .408	-.061 .698	-.223 .150	.147 .346
The teachers get angry in class	r p	-.167 .284	.026 .870	.043 .786	-.053 .738	-.004 .978
The teachers are authoritarian	r p	.050 .750	.012 .939	.127 .418	-.025 .876	.172 .270
The teachers are patient	r p	.093 .553	-.012 .939	.150 .335	.234 .131	-.027 .864
The students irritate the teachers	r p	.120 .442	.281 .068	.166 .288	.020 .897	.266 .085

Table 5-26 Correlation of items from DREEM Academic Self-Perception Subscale and Cognitive Appraisal of Control

DREEM Academic Self-Perception Subscale Items	r = Pearson Correlation p = Significance (2-tailed)	Cognitive Appraisal of Control				
		I have a great deal of control over my academic performance in my courses	The more effort I put into my courses, the better I do in them	I see myself as largely responsible for my performance throughout my college career	When I do poorly in my courses, it is usually because if haven't given it my best effort	My grades are basically determined by things beyond my control and there is little I can do to change that
I am able to memorize all I need	r p	.324 .034	.354 .020	.171 .273	.324 .034	-.282 .067
Much of what I have to learn seems relevant to a career in chiropractic medicine	r p	.485 .001	.502 .001	-.085 .588	.379 .012	-.541 .000
I feel I am being well prepared for my profession	r p	.326 .033	.354 .020	.265 .085	.344 .024	-.508 .000
Last semester's work has been a good preparation for this semester's work	r p	.250 .106	.388 .010	.282 .067	.493 .001	-.587 .000
My problem-solving skills are being well developed here	r p	.652 .000	.685 .000	.341 .025	.435 .004	-.654 .000
I am confident about passing this semester	r p	.508 .000	.695 .000	.481 .001	.422 .005	-.599 .000
I have learned a lot about empathy in my profession	r p	.298 .052	.339 .026	.011 .945	.146 .350	-.472 .001
Learning strategies which worked for me before continue to work for me now	r p	.515 .000	.663 .000	.262 .090	.480 .001	-.600 .000

Table 5-27 Correlation of items from DREEM Academic Self-Perception Subscale and Cognitive Appraisal of Value

DREEM Academic Self-Perception Subscale Items	r = Pearson Correlation p = Significance (2-tailed)	Cognitive Appraisal of Value				
		How important is the process of learning to you?	I feel that, to me, doing well in my studies is…	How important is it for you to get good grades?	Compared to most of your other activities, how important is it for you to perform well academically?	How useful is doing well at school to your future career as a chiropractic physician?
I am able to memorize all I need	r p	.206 .186	.007 .965	.094 .551	.116 .459	.149 .340
Much of what I have to learn seems relevant to a career in chiropractic medicine	r p	.039 .803	-.060 .704	.024 .876	.089 .568	-.084 .592
I feel I am being well prepared for my profession	r p	-.027 .862	.006 .968	.085 .588	.144 .355	-.107 .494
Last semester's work has been a good preparation for this semester's work	r p	.084 .594	-.011 .946	.033 .832	.103 .512	.101 .521
My problem-solving skills are being well developed here	r p	-.115 .461	-.113 .472	-.187 .230	-.142 .364	-.254 .101
I am confident about passing this semester	r p	-.103 .510	-.103 .510	-.171 .272	-.122 .435	-.175 .261
I have learned a lot about empathy in my profession	r p	.055 .726	-.029 .856	-.047 .763	.058 .710	-.183 .241
Learning strategies which worked for me before continue to work for me now	r p	.096 .539	-.101 .520	-.124 .429	-.047 .764	-.192 .219

Table 5-28 Correlation of items from DREEM Perception of Atmosphere Subscale and Cognitive Appraisal of Control

DREEM Perception of Atmosphere Subscale Items	r = Pearson Correlation p = Significance (2-tailed)	Cognitive Appraisal of Control				
		I have a great deal of control over my academic performance in my courses	The more effort I put into my courses, the better I do in them	I see myself as largely responsible for my performance throughout my college career	When I do poorly in my courses, it is usually because if haven't given it my best effort	My grades are basically determined by things beyond my control and there is little I can do to change that
The atmosphere is relaxed during lectures	r p	.578 .000	.672 .000	.155 .319	.373 .014	-.493 .001
I feel able to ask the questions I want	r p	.573 .000	.712 .000	.411 .006	.316 .039	-.402 .007
I feel comfortable in class socially	r p	.466 .002	.744 .000	.206 .185	.267 .083	-.471 .001
There are opportunities for me to develop interpersonal skills	r p	.356 .019	.487 .001	.011 .942	.324 .034	-.534 .000
The atmosphere is relaxed during lectures	r p	.616 .000	.489 .001	-.016 .920	.070 .654	-.188 .227
The enjoyment outweighs the stress of studying chiropractic medicine	r p	.506 .001	.550 .000	.160 .305	.333 .029	-.388 .010
The atmosphere motivates me as a learner	r p	.452 .002	.563 .000	.093 .555	.305 .047	-.581 .000
I am able to concentrate well	r p	.475 .001	.625 .000	.346 .023	.461 .002	-.440 .003
The atmosphere is relaxed during seminars and labs	r p	.467 .002	.478 .001	-.032 .840	.129 .411	-.292 .058
The school is well timetabled	r p	.406 .007	.420 .005	-.082 .600	.178 .254	-.408 .007
I find the experience disappointing	r p	-.421 .005	-.761 .000	-.335 .028	-.577 .000	.512 .000
Cheating is a problem in this school	r p	-.167 .285	-.215 .167	.119 .446	.015 .924	.154 .324

Table 5-29 Correlation of items from DREEM Perception of Atmosphere Subscale and Cognitive Appraisal of Value

DREEM Perception of Atmosphere Subscale Items	r = Pearson Correlation p = Significance (2-tailed)	Cognitive Appraisal of Value				
		How important is the process of learning to you?	I feel that, to me, doing well in my studies is…	How important is it for you to get good grades?	Compared to most of your other activities, how important is it for you to perform well academically?	How useful is doing well at school to your future career as a chiropractic physician?
The atmosphere is relaxed during lectures	r p	.076 .627	-.140 .371	-.133 .396	-.055 .727	-.274 .075
I feel able to ask the questions I want	r p	-.045 .774	-.232 .134	-.090 .565	-.037 .813	-.351 .021
I feel comfortable in class socially	r p	-.042 .787	-.168 .281	-.044 .780	-.029 .854	-.302 .049
There are opportunities for me to develop interpersonal skills	r p	.058 .714	-.030 .849	.052 .741	.061 .697	-.150 .338
The atmosphere is relaxed during lectures	r p	-.066 .672	.029 .851	.005 .974	.032 .837	-.255 .099
The enjoyment outweighs the stress of studying chiropractic medicine	r p	.069 .659	.127 .416	.045 .773	.024 .876	-.085 .589
The atmosphere motivates me as a learner	r p	-.107 .496	.016 .921	-.081 .608	-.060 .702	-.095 .546
I am able to concentrate well	r p	-.034 .827	-.119 .448	-.197 .205	-.110 .484	-.184 .239
The atmosphere is relaxed during seminars and labs	r p	.056 .721	-.004 .978	-.112 .473	-.046 .768	-.352 .021
The school is well timetabled	r p	-.081 .605	.120 .443	.045 .775	.081 .608	-.138 .377
I find the experience disappointing	r p	-.059 .707	.205 .188	.253 .101	.150 .337	.215 .166
Cheating is a problem in this school	r p	-.049 .754	-.154 .324	-.255 .098	-.178 .254	-.113 .472

Table 5-30 Correlation of items from DREEM Social Self-Perception Subscale and Cognitive Appraisal of Control

DREEM Social Self-Perception Subscale Items	r = Pearson Correlation p = Significance (2-tailed)	Cognitive Appraisal of Control				
		I have a great deal of control over my academic performance in my courses	The more effort I put into my courses, the better I do in them	I see myself as largely responsible for my performance throughout my college career	When I do poorly in my courses, it is usually because if haven't given it my best effort	My grades are basically determined by things beyond my control and there is little I can do to change that
I have good friends in this school	r p	.514 .000	.658 .000	.214 .168	.347 .023	-.466 .002
There is a good support system for students who get stressed	r p	.464 .002	.423 .005	.160 .307	.204 .189	-.252 .104
I am too tired to enjoy this school	r p	-.258 .094	-.388 .010	-.266 .084	-.255 .099	.423 .005
I am rarely bored in this program	r p	.291 .059	.269 .081	.269 .081	-.006 .971	-.121 .440
My accommodation is pleasant	r p	.451 .002	.563 .000	.190 .223	.418 .005	-.695 .000
My social life is good	r p	.178 .253	.357 .019	.303 .048	.127 .418	-.241 .119
I seldom feel lonely	r p	.232 .135	.263 .088	.304 .047	.009 .953	-.123 .432

Table 5-31 Correlation of items from DREEM Social Self-Perception Subscale and Cognitive Appraisal of Value

DREEM Social Self-Perception Subscale Items	r = Pearson Correlation p = Significance (2-tailed)	Cognitive Appraisal of Value				
		How important is the process of learning to you?	I feel that, to me, doing well in my studies is…	How important is it for you to get good grades?	Compared to most of your other activities, how important is it for you to perform well academically?	How useful is doing well at school to your future career as a chiropractic physician?
I have good friends in this school	r p	.049 .753	-.152 .329	-.062 .692	-.041 .794	-.110 .482
There is a good support system for students who get stressed	r p	-.097 .535	-.115 .465	-.228 .142	-.245 .113	-.196 .207
I am too tired to enjoy this school	r p	-.025 .874	.252 .104	-.016 .921	-.057 .716	.118 .452
I am rarely bored in this program	r p	-.083 .597	.064 .686	-.127 .417	.054 .730	-.330 .031
My accommodation is pleasant	r p	-.022 .889	-.096 .540	-.335 .028	-.314 .040	-.252 .103
My social life is good	r p	-.165 .289	-.228 .141	-.093 .553	-.086 .582	-.087 .577
I seldom feel lonely	r p	-.123 .431	-.066 .676	.081 .604	-.007 .967	-.148 .345

5.6 Qualitative Analysis

The six interviews were recorded, and the recordings indicate that the discussions were casual and lively. The students appeared happy and willing to be part of this research process. The students, by necessity, were all known to the researcher, but the interviews were conducted professionally and with serious intent. Facilitatory questions were asked of each participant, with occasional clarifications of the intent of the questions, as well as probes to enhance and encourage responses. The researcher, especially because of his prior familiarity and relationship with the students was particularly and reflexively conscious of the importance of minimizing

researcher interference in the collection of data, a concern of all social science research (Moses & Knutsen, 2012). This was reflected in a minimum of verbal cues other than when probing questions were appropriate. Moses and Knutsen (2012, p. 11) acknowledged this concern by stating that "observations and experience depend on the perspective of the investigator; they are not neutral and not necessarily consistent across investigators". Assurances of confidentiality were provided prior to the start of each interview, and the validity of the responses is assumed because of the collegial setting and demeanor of each interview participant. Nonetheless, research-based interviews, like all social science research, can never completely assert validity and fidelity of responses but can make reasonable assumptions of confidence (Bottery, Ngai, Wong & Wong, 2013). Analysis of the data from the six semi-structured interviews resulted in four overarching themes describing student perceptions of the educational environment, their cognitive appraisals of control and value, and the relationship of all three of these elements. These overarching themes were:

- The educational environment is more personal than physical
- Social elements and relationships are most important in the educational environment
- Students feel they have (considerable) control over their academic performance
- Students are highly personally driven and place high value on their studies

5.6.1 Description of educational environment

There was a broad understanding of the term, "educational environment", consistent with view of Roff and McAleer (2001). Several participants described the educational environment in terms of the physical environment, but there was a more common theme relating the environment to the individual learner ("it is more than learning; it is about you, as an individual and how others relate to you" – Jane, second year student). Even when describing the more

commonly understood elements of an "environment", several students enhanced their comments by describing their relationship to the environment ("it is social, physical, teaching; but it needs to be supportive, not strict, but firm on expectations; fair, comfortable, with a reliable and confident instructor" – Sally, first year student). Another student concurred, "it includes the students and the physical surroundings; but it must be conducive to learning" – Tom, first year student. Another student added, "it is the classroom management, objectives and learning processes; but it must include feedback; it must be interactive so that it becomes your plan rather than the teacher's" – Dave, second year student. Only two of six students described the educational environment without referring to the personal impact of the environment ("it is all of the external factors; the classroom, equipment, faculty and students" – Mary, second year student; "it is the physical space and the tools to learn" – Sarah, second year student). Probing did not elicit any broader or deeper understanding than that characterized by the quotes provided above.

5.6.2 Impact of educational environment on learning

Consistent with the range of responses describing the educational environment, students tended to describe elements of the social environment as far more important than the physical environment as determinants of learning. In fact, one student noted, "if it is too hot or too cold, I can fix that; but I need to feel comfortable with my classmates and faculty" – Sarah, second year student.

Students tended to identify factors they perceived related to their learning rather than the mechanism of relationship of the environment to learning (i.e. they described the "what" but not the "how"). These factors included "good, positive faculty; a quiet study area; availability of the library; WIFI" – Jane, second year student; "(the environment) needs structure, needs

accountability, I need to be free to express myself" – Sally, first year student; "the ideal environment is when we're all working together" – Tom, first year student.; "technology – it can increase or decrease learning depending on whether it works or not" – Sarah, second year student. Structured learning activities was identified by one second-year student who felt that "people excel more when the environment is structured; there shouldn't be any down-time; all the time should be filled with educational activities" (Dave). Another student emphasized the personal nature of the environmental influence on learning, "I'm visual and hands-on; I need a visual, hands-on environment" – Tom, first year student. Clearly there was a trend towards identifying social elements of the environment rather than physical elements. "Students and faculty must be respectful and patient with each other" – Tom, first year student. Another student expressed the same idea, "the faculty must be friendly, my classmates supportive and friendly, and the topics relevant to my career" – Sarah, second year student.

One student provided an insightful comment about the importance of the social environment, "students can bring their own environment to the classroom setting" – Tom, first year student. Another seconded this perspective, emphasizing the importance of the student mastering the environment, "whatever the environment – emotional, social – I adapt and still get it done" – Mary, second year student. This sentiment was also expressed by another student:

"I am driven by the end result. The educational environment is not important – I am here for myself" – Tom, first year student

5.6.3 Perception of control over academic performance

All six interviewees expressed views that they had considerable (some said "complete") control over their academic performance. The following are noteworthy comments:

"We put the burden on the professors, but as a student I feel I have control over my academic performance; some things are out of my control, but when we put in the work, we get the results" – Jane, second year student

"Everyone should have the responsibility for their own learning; once you see the results of your work, you know you have control" – Dave, second year student

"It's all on me at the end of the day; I still have to get it done; it's all in my control" – Mary, second year student

"I have 100% control over my performance; my relationship with my peers and the faculty is under my control; ultimately (it is) up to me" – Sally, first year student

"I have total control over performance, but not the environment – students and facilities – but everything is fixable" – Sarah, second year student

Only one first-year student (Tom) qualified this perception of control: "it depends on the instructor – I have full control when the instructor gives me the tools I need". But this student also added that "it is driven by the end result – the educational environment isn't as important - I'm here for myself".

5.6.4 Perception of value of professional education

Consistent with the students' views of personal control over their academic performance, they all shared the view that, as future professional healthcare workers, they placed very high value on their studies. This may be assumed intuitively in a population of students paying high tuition fees leading towards professional qualifications, but their comments also tended to support the observation that perception of value was not as related to the educational environment as Pekrun's Control-Value Theory might predict. Responses indicating the perception of value of their professional education included:

"A great deal of value. I am going to be a physician and once you realize that you are going to be a physician you want to make (my university) proud, you want to provide excellent care to patients, you want to be a good alumnus and physician" – Jane, second year student

"This is the last career change I want to make; I am very passionate about this program and I place great value on the education I am receiving" – Dave, second year student

"At this stage of my life (i.e. as an older student) my personal standards dictate the value I place on what matters to me" – Mary, second year student

The theme of the importance of personal standards was repeated by another first year student:

"I have high personal standards for myself and my university. I place immense value on my education. I know my perceptions and my opinions do matter" (Sally)

Another student mentioned that the value of their education was related to the pride related to going to a professional school:

"I place a high value on education. It's my family history. The value is related to family pride more than personal (pride). Pride in achievement belongs to me – nobody can take it away from me. If everyone went to med school, I wouldn't value it as much" – Tom, first year student

Another student mentioned the importance of their family in influencing the value they placed on their education:

"For me, it is super important. I value it because of its cost. I value it for my family. I'm really clear on what I want, and I'm focused on the end point. Nothing can take the value away from that" – Sarah, second year student

5.6.5 Summary comments by participants

The interviews concluded with an opportunity for the student participants to make a summary statement or comment. Interviewees generally took advantage of this opportunity with enthusiasm, although some mistook this as an opportunity to outline some unrelated complaints to the interviewer (examples: "noise from classmates can distract me from focusing on my studies" – Jane, second-year; "there are cliques here and some personal conflicts that decrease my drive to succeed" - Mary, second-year; "there is a trust issue with some of the staff" – Mary, second-year). Other comments generally indicated the importance (or presence) of personal value and motivation (as more important than the environment *per se*). Representative comments included:

"Social aspects can influence learning; a supportive family, and time for family and school. We need to prioritize our time management" – Jane, second year student (this same student ventured the idea that if administrators wanted to know about the educational environment, they could do so by "sitting in class and experiencing what students are experiencing").

"It is like I will be doing with patients in the clinical environment – I want them to value their care, and to feel that they have control over it" – Dave, second year student

"(regarding the value of education) …the professor makes all the difference – whatever their value is, it permeates the learning environment" – Mary, second year student

One second-year student (Sarah) summed up her experience with this comment, "It's up to us. Students must feel comfortable to succeed, or they will switch to another school".

Chapter 6 – Discussion

Forty-seven students responded to a call to volunteer to complete a survey about the educational environment. Of these, forty-three returned valid survey results, which represented 67.3% of the total population of 64 students. These students were studying in their first or second year of the chiropractic medicine program at the researcher's home university and were distributed among all six semesters of study (note – at the researcher's university, the students study during all three terms of the year which are still called "semesters" at the university). The descriptive data describing these respondents, including gender, age, ethnicity, and pre-chiropractic background showed a similar profile to the total population of students. Cross-tab analysis using the Chi-square test showed that students from all six semesters did not differ significantly with regards to distributions of age, ethnicity, or pre-chiropractic background. A difference in the distribution of gender was noted with a higher proportion of male respondents in the first semester and a higher proportion of female respondents in the third semester. While the gender distribution among the six cohorts of student respondents, this was considered artifactual due to the small cohort sizes and unequal numbers of male and female students enrolled in the cohorts.

The total DREEM score, 198.33/250, is in the top quartile which, according to the customary use of this instrument, would represent an excellent educational environment (Luciani et al., 2015). All subscale scores were in the upper quartiles:

- Perception of Learning – top quartile ("excellent")
- Perception of Teaching – top quartile ("excellent")
- Academic Self-Perception – top quartile ("excellent")
- Perception of Atmosphere – top quartile ("excellent")

- Social Self-Perception – second to top quartile ("more positive than negative")

The use and interpretation of total DREEM scores have been criticized because the subscales are essentially independent instruments whose total score may mask differences among the subscales; even the subscales themselves may have a bimodal distribution making interpretation of a score difficult (Till, 2004). The total score and subscale scores are reported in this current study, but an interpretation of these scores is not offered (other than to suggest that, by common usage, they represent a good to excellent educational environment; and, that the scores obtained are similar to reported scores in other studies, a form of external validation) because the aim of the research was to identify correlations between DREEM items and cognitive appraisals of control and value. A final note related to the interpretation of total DREEM scores – two studies reported the association between high DREEM scores and high academic achievement (Mayya & Roff, 2004; Sun, 2003). In both of these studies it was suggested that the perception of a positive educational environment is conducive to learning, with the resultant high academic achievement.

The lowest scoring DREEM subscale was Social Self-Perception (although it scored in the 73rd percentile, just short of the top quartile). Roff et al (1997) referred to this subscale as measuring "the personal life of the students" (p. 296). The chiropractic medical program is extremely rigorous and student stress, particularly in the early semesters is common. The highest scoring items were related to having "good friends in this school" and pleasant accommodation. The lower scoring items included the support system for students who get stressed and being too tired to enjoy the course (which could also be related to the rigor of the program and the long hours of study).

The data provided by the five-item Perception of Control scale showed good internal validity, with a Cronbach's alpha of 0.763. The highest scoring item was "I see myself as largely responsible for my performance throughout my college career". This item did not have one student scoring "strongly disagree" and had the lowest standard deviation of all five items. Interestingly several students used these very words during the interviews. Items also scoring high were "I have a great deal of control over my academic performance in my courses" and "the more effort I put into my courses, the better I do in them". The negative item, "my grades are basically determined by things beyond my control and there is little I can do to change that" scored very low, indicating general disagreement with this negative statement. While this study did not seek to interpret the results of the control and value scales, other than in the context of their relationship to elements of the educational environment, it was nonetheless gratifying to see that these study participants identified with a high level of control over their academic performance. As outlined in the literature review, a high level of perceived control is associated with better academic outcomes, positive attributes such as motivation and perceived control over life, and self-regulated learning skills. Perry et al. (2001) considered academic control as "a relatively stable psychological disposition" (p. 777), reflecting students' beliefs about academic success. The item scores obtained in this study are generally in agreement with the scores and standard deviations obtained by Perry et al. (2001) in their study of 524 Canadian college psychology students.

The data provided by the five-item Perception of Value scale showed good internal validity, with a Cronbach's alpha of 0.851. These five items were selected following the work of Hall et al. (2016), who was also personally contacted to confirm the accuracy of the items. This instrument was derived from original work by Eccles et al. (1983), later refined by Battle and

Wigfield (2003). Eccles and her co-workers determined that there were four aspects to the subjective perception of value: intrinsic value (personal enjoyment), attainment value (importance of doing the task), utility value (useful for future goals) and cost. Due to the nature of cost (a highly contextual value) it was dropped in a later iteration of the instrument (Eccles & Wigfield, 1995). Finally, Battle and Wigfield (2003) combined intrinsic and attainment value into a single value, following factor analysis of their data. The five-item instrument used in this study includes one intrinsic value question, three attainment value questions, and one utility value question. These are useful for a deeper understanding of the nature of the values held by research participants, but Hall (personal communication) maintains that the value scale must be viewed as a single multidimensional scale. As stated previously, this is consistent with Pekrun's holistic view of the cognitive appraisal of value, which does not differentiate specific value types.

All five items in the Perceived Value instrument scored very high. Due to an error, the scoring was measured with a reverse scale (1 = very important, 5 = not at all important), therefore the reported average scores from the lowest, 1.0698, to the highest, 1.3488, all represent very high cognitive appraisals of value. The intrinsic value question was "How important is the process of learning to you?" and this item scored a mean of 1.1163 indicating high value placed on the personal importance of learning in this program. The three attainment value questions were "I feel that, to me, doing well in my studies is…", "How important is it for you to get good grades", and "Compared to most of your other activities, how important is it for you to perform well academically". The mean score for these three items was 1.1783, indicating a very high value placed on the importance of doing well. Finally, utility value was measured by the fifth item, "How useful is doing well as school to your future career as a chiropractic

physician" and the mean score was 1.3488. The range of all 43 responses was from 1 (very important) to 3 (neutral) with no negative responses for any of these five items by any student.

Next, the data were analyzed to determine if there were any differences in item responses from students studying in year 1 and year 2. Levene's Test for Equality of Variances showed significant differences in 9 of the 60 total items. Two items from the Perception of Teaching subscale showed that second year students scored significantly lower when measuring teacher preparation for class, and teachers providing constructive criticism. This may have been related to the fact that the second-year students had expressed criticism of one specific professor in the recent past and perhaps took advantage of this survey to continue to do this. Palmgren and Chandratilake (2011) commented on this phenomenon (although in reverse) in their study of Scandinavian chiropractic students using DREEM – they felt that students might not be honest by avoiding criticizing their teachers. In fact, this was partly their justification for their mixed methods research, because they felt that survey-based perceptions might be misleading when used alone. In the present study, the context of the low scores for these two items is not particularly surprising and is assumed to reflect a local context effect rather than a systemic issue. This cohort-context effect is likely responsible for these same students scoring lower on "the atmosphere motivates me as a learner".

There was one item on the Perception of Control scale that showed a significant difference between Year 1 and Year 2 students: "I see myself as largely responsible for my performance throughout my college career". Year 1 students scored lower on this item and the meaning of this isolated finding is not clear. Regardless of the underlying cause or factors responsible for this finding, it suggests that by the time the students are in their second year of study (at least for this cohort of students), they are assuming more personal responsibility for

their academic performance, and in doing so, asserting greater perceived control over their achievement.

All five items on the Perception of Value scale showed significant differences between first- and second-year students. In all instances, the second-year students showed lower value scores. The significance levels for these differences were robust, with four items showing p values of 0.000 to 0.001, and the fourth item significant at the $p = 0.032$ level. Clearly there is a difference in the cognitive appraisal of value in these two populations of chiropractic students. The qualitative data obtained from interviews did not support such a difference, with all 6 interview participants identifying strongly with a high perceived value for their education. Battle and Wigfield (2003) described perceived value as something that determines one's decision to enter a field. For some reason, second year students may be losing some of that perceived value as they proceed through the program. Further study into this phenomenon should seek to understand why this may be happening (assuming this finding is duplicated on a future study). Intuitively, and knowing the nature of the program of study, students tend to be so immersed in their studies by the second year that they may be distracted from their original calling or purpose. An old joke comes to mind and may be apropos, "when you are up to your neck in alligators, it is easy to forget that you were there to drain the swamp". The only analogy in allopathic medical education that was found was Dunham et al. (2017) who found that medical students' ($n = 4262$) perceptions of their learning environments worsened in the first three years of their four year program (with some slight recovery in the fourth year) – a phenomenon thought to be related to work-life balance and social relationship issues. While Dunham et al.'s work is not explicitly related to perceived value (as in the current study), their inference is noteworthy and possibly relevant to the finding of decreased perception of value in second year students.

The original aim of the research was to identify any significant relationships between elements of the educational environment (as measured by DREEM) and the cognitive appraisals of control and value, hypothesized by the Control-Value theory to be strongly related. Therefore, each item of the 50-item DREEM instrument was correlated with each item of the control and value instruments, resulting in a massive matrix that could not be displayed in one Table or Figure. Instead, the correlations were displayed (Tables 5-22 to 5-31) with each DREEM subscale correlated with items from the control and value instruments separately. These results revealed an interesting picture of the connection between the educational environment and cognitive appraisals of control and value.

Table 5-22 shows the correlation of items from the DREEM Perception of Learning subscale with the cognitive appraisal of control (Perception of Control scale). There is a total of 60 cells in this table, 30 of which show statistically significant correlations, ranging from a low of $p = .000$ to $p = .047$. Of these 30 statistically significant correlations, 21 are at the significance level of $p < .01$. Clearly there is a considerable correlation of items from these two instruments. Two items in the cognitive appraisal of control scale had only one or two significant correlations each. These two items were "I see myself as largely responsible for my performance throughout my college career" and "When I do poorly in my courses, it is usually because I haven't given it my best effort". The former item scored very high in the Perception of Control scale (4.72) and the latter item scored lower (3.58) so they were not particularly inter-related items. This suggests that the idea of being largely responsible for one's academic performance seems unconnected with, and independent of the DREEM Perception of Learning items (other than the one significant correlation with "Long-term learning is emphasized over short-term", which was significant at the $p = .038$ level). A similar result occurred with the

control item related to doing poorly in courses because of having not given it a best effort. In this case, the only significant correlations were with "The teaching is sufficiently concerned to develop my competence" ($p = .018$) and "The teaching is too teacher centered" (a strong negative correlation, $p = .000$). The other three control items were very strongly correlated with most of the items in the Perception of Learning subscale. For this particular subscale, educational environmental items were generally correlated with the cognitive appraisal of control, as predicted by the Control-Value theory.

Table 5-23 shows the correlation of items from the DREEM Perception of Learning subscale and the cognitive appraisal of value (Perception of Value scale). There is a marked difference in this table from Table 5-22, with only one cell showing a statistically significant correlation ("The teaching time is put to good use" and "How useful is doing well at school to your future career as a chiropractic physician", $p = .045$). Other than this one cell, there are no other correlations that are even close to significant. These two sets of variables appear almost completely unrelated, something that would not be predicted by the Control-Value theory. Perception of Learning was described by Roff et al. (1997) as the students' view of teaching. From these results for this small sample of chiropractic medical students in one institution, this aspect of the educational environment does not influence the cognitive appraisal of value.

Tables 5-24 and 5-25 show the correlations of items from the DREEM Perception of Teaching with the cognitive appraisals of control and value, respectively. Roff et al. (1997) described this DREEM subscale as the students' view of teachers. A similar picture emerges from these data. The correlation of DREEM items with the cognitive appraisal of control shows statistically significant results in 34 of 55 cells. Although there were still 4/11 cells with significant correlations, the weakest correlations were found with the control item "I see myself

as largely responsible for my performance throughout my career", as was observed with the Perception of Learning subscale in Table 5-22. Also, like what was observed with the Perception of Learning subscale, there was an almost negligible correlative relationship between the Perception of Teaching and the cognitive appraisal of value. In this case (Table 5-25), only two of 55 cells showed a statistically significant correlation. These were the correlations of "The teachers are knowledgeable" ($p = .002$) and "The teachers are well prepared for their classes" ($p = .028$) with the value item "How useful is doing well at school to your future career as a chiropractic physician". This value item is considered to measure utility value, so in both cases of the Perception of Learning and the Perception of Teaching, there was only a weak correlation with utility value, and no correlation at all with intrinsic value and attainment value. Thus, these two elements of the educational environment, teaching and learning, appear to be strongly related to the cognitive appraisal of control (as predicted by the Control-Value theory) but negligibly related to the cognitive appraisal of value (only utility value; in contrast to the predictions of the Control-Value theory).

Correlations of the DREEM Academic Self-Perception subscale and the cognitive appraisals of control and value are shown in Tables 5-26 and 5-27, respectively. Roff et al. (1997) described this DREEM subscale as measuring students' feelings about career and approaches to learning. This DREEM subscale showed the same results as the previous two. The items were very strongly correlated with control (30 of 40 cells showing statistically significant correlations) but there was no correlation at all with value (zero cells showing significant correlations, with none of them even approximating the level of significance). Also, as with the previous two subscales, the weakest element of the cognitive appraisal of control was the item related to the personal responsibility for academic performance. The elements of

control and value have occasionally been referred to by the questions, “Can I master it?” (control) and “Does it matter?” (value). Put in this perspective, the educational environment strongly correlates with the notion of mastery but does not influence or correlate with the notion of importance, at least as shown empirically in a small population of chiropractic medical students.

Tables 5-28 and 5-29 show the correlations of items from the DREEM Perception of Atmosphere subscale with the cognitive appraisals of control and value, respectively. Roff et al. (1997) referred to this subscale as the atmosphere in the class or in the institution. This would represent the educational environment measure related to the overall facility including the physical aspects of the environment. Again, the results mirrored what was seen in the previous sections – a very strong correlation of DREEM subscale items with the cognitive appraisal of control (41 of 60 cells showing statistically significant correlations) and a negligible relationship between these DREEM subscale items and the cognitive appraisal of value (3 of 60 cells showing statistically significant correlations). Again, the weakest control element was related to the personal responsibility for performance (3 of 12 cells showing statistical significance) and the only value element with any significant relationships was the item related to utility for the future career (3 of 12 cells showing statistically significant correlations). Again, the educational environment, this time related to the atmosphere or climate within the class or institution, was strongly correlated with the cognitive appraisal of control, but very weakly correlated with the cognitive appraisal of value (and entirely limited to utility value).

The last two tables (5-30 and 5-31) relate to the correlation of items from the DREEM Social Self-Perception subscale with the cognitive appraisals of control and value, respectively. Roff et al. (1997) described this subscale as related to the personal life of the students. Once

again, there was a strong correlation of this DREEM subscale with the cognitive appraisal of control (15 of 35 cells showing statistically significant correlations) and a very weak correlation of this subscale with the cognitive appraisal of value (3 of 35 cells showing statistical significance). Also, similarly to the other subscales, the weakest element of the control items was related to the personal responsibility for academic performance. Within the value items, the three significant correlations related to the students' accommodations (2 items) and the fact that the students were rarely bored in the school. There does not appear to be any obvious pattern of significance to these findings. All the other cells in Table 5-31 did not even come close to statistically significant correlations.

As predicted by the Control-Value theory, all the educational environment measures were strongly correlated to the cognitive appraisal of control. These empirical findings support Pekrun's theoretical construct by which the educational environment influences the cognitive appraisal of control, which in turn is hypothesized to positively influence achievement emotions. However, in contrast to the predictions of the Control-Value theory, none of the five educational environment measures in this study correlated with the cognitive appraisal of value, except for negligible correlations with the dimension of value related to the utility of the educational program for a future career. The magnitude of these differences is noteworthy. The Perception of Value scores were all very high, indicating a strong trend towards the students valuing their careers and the importance of their decision to enter into these studies. However, the broad scope of the educational environment measured by the DREEM instrument showed either zero or negligible correlations with this strong personal appraisal of value. The empirical findings suggest that, for this study population, cognitive appraisals of value are independent of the educational environment. Whether this is an isolated finding for this population, or a finding

related to the uniqueness of students entering into chiropractic medical studies, or a finding related to other health professional students as well, is a subject for future research. Sobral's study of Brazilian medical students (2004) showed that perception of value was correlated positively with DREEM subscale scores, particularly for the subscales of Perception of Learning and Social Self-Perception. However, Sobral used a different measure for the perception of value – he used a seven-item "course valuing index" that purported to measure the same components described by Eccles which was the basis for the instrument used in the current research. The reason for the difference in Sobral's results and the current study may be related to the nature of Brazilian medical students versus chiropractic medical students at the researcher's university, or it may be due to some inherent differences in the two instruments used to measure value, or other factors.

In the current study, at least based on quantitative data, it has been shown empirically that only the cognitive appraisal of control is related to the educational environment. Value appraisals appear to be very personal and unaffected by environmental factors.

Data from the interviews of six students tend to support the observations from the quantitative data. Palmgren and Chandratilake (2011) recommended obtaining interview data when studying what they a delicate matter, that is getting students to be honest and forthright in describing the educational environment. They thought the students may feel wary of making negative statements about their institution on surveys despite the assurances of confidentiality. The mixed methods methodology was intended to verify the survey-based data through triangulation. Denz-Penhey (2009) also mentioned the importance of triangulating DREEM data through interviews to obtain meaning-filled interpretations of (possibly sensitive) perceptions.

The student interviews generally revealed that the students are very personally driven in their chosen field of study. Moos (1973) long ago asserted that personal growth constitutes one of the key elements of human environments. Building on this idea, Kern et al., (2001) suggest that the outcomes of this personal growth are changes in values and goals, improved relationships and increased productivity and creativity. Such outcomes would certainly be conducive to positive achievement emotions and improved academic outcomes (and ultimately, more effective and safer patient care). While some students took what they considered an opportunity for private time with the dean and therefore an opportunity to provide constructive criticism of the institution and faculty, all the interviewees nonetheless expressed very personal thoughts about their ideas of control, value, and their future careers.

The quantitative data showed a significant difference in the cognitive appraisal of value between the first- and second-year students, with the first-year students having higher levels of perceived value. This difference was not borne out in the interviews, although only three first-year and three second-year students participated. However, all interview participants constantly referred to relationships as being more important than physical facilities, and the personal importance of succeeding in their studies. From the standpoint of an observer, it appeared very plain in the interviews that personal growth (and the responsibility for this growth) were all very important to the students. They all appeared to have deeply held convictions about becoming chiropractic physicians. Several students expressed their views about value in terms of the dimension of attainment value (e.g. “the value is related to family pride” and another student, “I value it for its cost, I value it for my family”). Others expressed their views relative to utility value (e.g. “I am going to be a physician and once you realize that you are going to be a physician you want to make (the university) proud, you want to provide excellent care to

patients, you want to be a good alumnus and physician", and another student, "This is the last career change I want to make"). But all students included comments that described value in terms of a personal journey, or what might be considered intrinsic value (e.g. "I'm really clear on what I want, and I'm focused on the end point. Nothing can take the value away from that"). It would be very interesting to track the students' cognitive appraisals of value to see if, on admission to the program, their perception of value was at its highest level (since it appeared to show a decrease among the second-year students). Perhaps students select chiropractic medical studies because of their deeply held beliefs in themselves and their calling to be members of this profession.

The quantitative data showed that students had very high levels of perceived control and that these perceptions were very strongly correlated with the educational environment. Interview data also supported these findings, with students referencing elements in the environment, such as their professors or classmates, but at the same time, clearly asserting that they feel totally in control of their academic performance and achievement. Every student expressed a similar sentiment that they were in control and, as one student put it, "It's all on me at the end of the day; I still have to get it done; it's all in my control". Perceived control is related to motivation, and in one of the earliest works on control, Rotter (1966, p.22) stated that those with high levels of perceived control had "stronger motivation…in achievement situations". This would make individuals with high levels of control ideal candidates for a rigorous educational course of study, in keeping with the assumptions of adult learning theory (Abela, 2009). The association of high levels of control and academic achievement has been previously described (Perry, Hladkyj, Clifton, & Chipperfield, 2005; Perry, Hladkyj, Pekrun, & Pelletier, 2001; Stupnisky, Perry, Renaud, & Hladkyj, 2013), and this present study does not attempt to study or predict

academic achievement. However, the interview comments seem to make it self-evident why students with high control are high academic achievers. They all very clearly expressed their high level of personal motivation to achieve, presumably fueled by their high levels of perceived value.

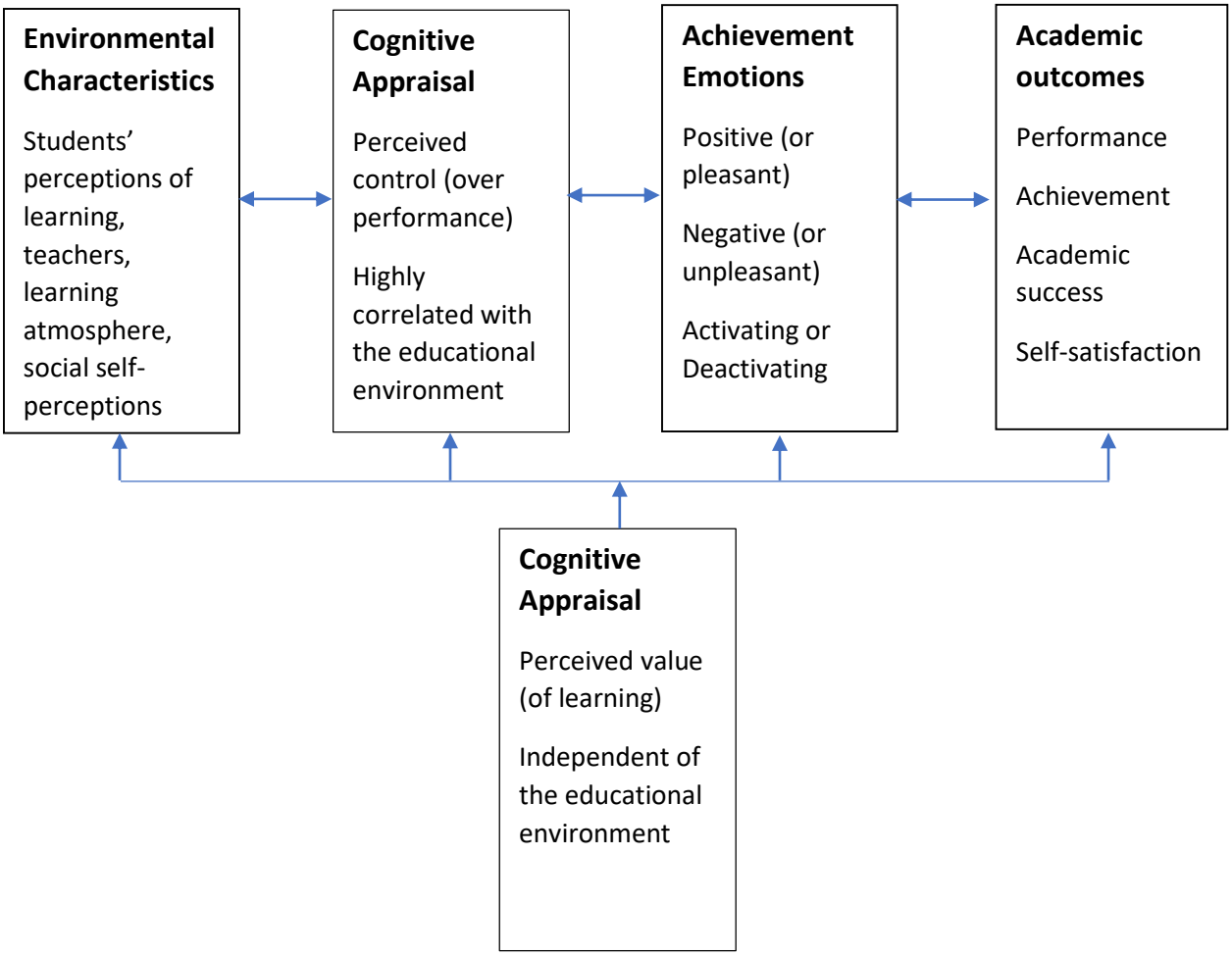
Pekrun's theoretical construct (Figure 2-1, on page 10) posits that educational environment characteristics influence cognitive appraisals of perceived control (over performance) and value (of learning). The present study supports Pekrun's proposed influence of the environment on perceived control, but it rejects Pekrun's model regarding perceived value insofar as the educational environment had a zero to negligible correlation with perceived value. Interview data supported the notion of perceived value being an independent and intrinsic characteristic of the chiropractic medical students who participated in this study. Based on these findings, the components of the Control-Value Theory may be restated as shown in Figure 6-1, with perceived control being highly correlated with factors in the educational environment but perceived value being independent of the educational environment.

The inference from this result is that chiropractic medical students value the education that will provide them with future careers, to the extent that little or nothing in the educational environment will interfere or impede this perceived value. Whether or not this is related to independent internal factors and also whether this is a phenomenon found in students who are pursuing altruistic careers, such as medicine, remains to be determined. A study of 140 Thai medical students (Kunanitthaworn et al., 2018) in which the students completed a number of survey instruments designed to investigate their motivation for medical education showed that the personal preference for studying medicine was "important and played a vital role in motivation" (p. 8). Other factors motivating these students included gender (females were more

motivated than males), family, and personal choice. These findings are similar to the data collected from the interviews in the present study. A study of 60 Colombian medical students, based on responses to a structured questionnaire, sought information about the core values of the students (Hoffman, Acosta-Orozco, & Compton, 2015). The questionnaire asked students to state their preferred life-metaphor, and whether or not this metaphor had guided them since childhood. The authors report that "the most preferred metaphors were overwhelmingly: 'Life is like a journey or voyage' and 'Life is like an adventure'" (p. 579). This too sounds like these students are motivated and driven by values that transcend the educational environment.

Kao and Jager (2018) surveyed 591 medical students regarding their perception of a career in medicine as a "calling". Almost half strongly agreed that the practice of medicine was a "calling" and these students were significantly more likely to enter a primary care pathway for their residency training. These findings agree with those in this current study and suggest a possibility that Pekrun's Control-Value theoretical framework may not represent the educational path or continuum followed by students pursuing an altruistic career. Without additional data, however, this cannot be stated with confidence.

Figure 6-1 – Components of the Control-Value Theory as modified in the context of chiropractic education at the researcher's university



Chapter 7 – Conclusion

7.0 Research summary and contribution to knowledge

This research was conducted to advance chiropractic education by inquiring into the relationship between the educational environment and precedents of academic achievement, as encouraged by the "call to action" addressed to medical education researchers by Artino, Holmboe and Durning (2012b).

A goal of any educational program is, or ought to be, the achievement of a desired academic outcome. Designing educational environments that are conducive to desired academic outcomes is important, if not crucial to this process. It is a reasonable assertion that improvement of an educational program is dependent upon an understanding of the factors which impact educational outcomes. These can include, and indeed have been shown to be related to, factors in the educational environment and the students' subjective appraisal of control and value, particularly as it relates to so-called achievement emotions (Artino, Holmboe & Durning, 2012a).

There are very few studies of the educational environment in chiropractic colleges, and none related to appraisals of control and value, as precedents of achievement emotions. Also, the use of DREEM within an American chiropractic program is a unique and original contribution to chiropractic education.

First- and second-year chiropractic medical students were surveyed and interviewed to measure their perceptions of the educational environment (primarily using the Dundee Ready Educational Environment Measure, a widely used and validated instrument), and their perceptions of control (of academic performance) and value (of education). Pekrun's Control-Value Theory was used as a theoretical framework to predict a relationship between these three

variables. The theory predicted that elements of the educational environment would be influential on cognitive appraisals of control and value.

The research found that cognitive appraisal of control, as predicted, was very strongly correlated with elements of the educational environment, specifically all five domains covered by the DREEM instrument. However, the cognitive appraisal of value was found to be unrelated to the educational environment, at least insofar as it is measured by DREEM. Qualitative data from interviews supported the notion that the cognitive appraisal of value is an independent characteristic of chiropractic students, which may change in its intensity through the program but nonetheless bears little to no correlation to the educational environment as measured by DREEM.

Battle and Wigfield (2003) stated that "value" determines one's decision to enter a field. It was shown to be independent of the educational environment and likely an intrinsic characteristic of those individuals choosing to enter the field of chiropractic medicine (at the researcher's university; as no generalization can be made about chiropractic students other than the ones studied in this research). Battle and Wigfield go on to describe "control" as determining one's performance in their chosen field. This was shown to be highly correlated to elements of the educational environment.

The contributions to knowledge of this study include the first time the control-value theory was used to enquire into chiropractic education; the correlation of educational environment factors to cognitive appraisals of control and value, hitherto not investigated; and, the finding that perception of value was not correlated to perceptions of the environment, something not predicted by the control-value theory.

The findings of this study also draw attention to the importance of the personal life of students and how this is related to the cognitive appraisals of control and value. The DREEM subscale "Social Self-Perception" was described by Roff et al. (1997) as a measure of the personal life of the student. It is interesting that of all five subscales, this one was most related to cognitive appraisal of value (Table 5-31) and the least related to cognitive appraisal of control (Table 5-30). This subscale also received the lowest overall DREEM score (albeit still in the second highest quartile, representing "more positive than negative", but still lower than the other four subscales which scored in the top quartile). Finally, while Cronbach's alpha for this subscale was still acceptable (0.745), it was also the lowest coefficient of all DREEM subscales. The meaning of this is not entirely apparent but there does appear to be a possible reciprocal relationship between control and value in relation to this subscale, focusing some attention on the importance of the personal lives of the students.

The findings of this study will be disseminated to chiropractic educators through the submission of several papers to the Journal of Chiropractic Education and by the submission of several abstracts to the 2020 Association of Chiropractic Colleges – Research Agenda Conference (March 2020).

7.1 Answering the research question

Does the experience of first- and second-year chiropractic medical students support the hypothetical relationship between the educational environment and subjective appraisals of control and value?

The data obtained in this mixed-methods study support the hypothetical relationship between the educational environment and subjective appraisal of control, but do not support the hypothetical relationship between the educational environment and subjective appraisal of value.

7.2 Limitations and strengths of the study

There are many limitations to the interpretation and use of the findings of this research. To begin with, useful (that is, complete) surveys were returned by 67.2% of the total population of students. While this may be considered an acceptable rate of return, it nonetheless neglects the input of 21 of the total population of 64 students.

The DREEM instrument has been widely used, validated and reaffirmed as a useful measure of the educational environment in medical education (Roff, 2005; Roff & McAleer, 2015). Nonetheless a very recent paper (Palmgren, Brodin, Nilsson, Watson, & Stenfors, 2018) suggested that the psychometric properties of DREEM were not adequately supported when subjected to Mokken scale analysis. This has to do with the characteristics of participant responses to survey questions, in which elements (such as perceived difficulty, and clustering of items) may bias and possibly skew the results. Since the DREEM results were only used as indicators of correlation to perceived control and value, this would not likely influence the results of the present study. Some of the DREEM items are typically scored in reverse, something that is important if the DREEM scores are used in a comparative study. However, this was overlooked in the current study, something that, if anything, would result in slight increases in some subscale scores, making the overall program look even "better" than the raw scores indicate. This would not affect the correlation coefficients and the findings reported in this paper. Further to this, the DREEM scores were reported in the current study on a Likert-type scale from 1-5, whereas the original DREEM instrument used a 0-4 scale. Per the above mentioned comment, this would not affect the correlation coefficients, but it would require a correction to absolute DREEM scores if they were to be compared to those obtained in other institutions (which was not done in this study and therefore is not a present concern, but

something that should be corrected in future studies to allow for comparative analysis of the institution with other health-profession programs).

Another possible limitation has to do with the item cross-over between some DREEM items and the items used to measure cognitive appraisal of control. For example, some items on the Perception of Learning subscale may imply perception of control (e.g. "the teaching encourages me to be an active learner", and "the teaching is sufficiently concerned to develop my confidence"). A more advanced factor analysis would be needed to determine if there were items or clusters of items in DREEM that measured cognitive appraisals of control. For the purposes of the current study, it was assumed that this was not the case.

The qualitative data may have been influenced, despite all reflexive considerations and precautions, by the relationship between the researcher and the students, and by the power differential inherent in this relationship of a dean and his students. Ideally the interviews would have been conducted by an independent third party, but this was not possible. Furthermore, the facilitatory questions, in retrospect, may have been slightly challenging, occasionally requiring some clarification. Future studies should take this into account.

The primary strength of this research is the fact that it is the first time that factors in the educational environment have been correlated with cognitive appraisals of control and value, among chiropractic medical students (and quite possibly the first time among any population of university-level students). The findings supported the theoretical construct of the Control-Value Theory to the extent that cognitive appraisals of control were strongly correlated with elements of the educational environment; but, the findings also found little to no correlation of cognitive appraisals of value with the educational environment. This was an unexpected result that may

have implications for chiropractic education, specifically, and health professions education, in general, if further investigations support these findings.

7.3 Recommendations for practice

The participants in this study, as students in the chiropractic medical program, may have been selected in the admissions process, in part, for their expression of high value (of their professional education), so the lack of correlation of the educational environment with cognitive appraisal of value may be artifactual. However, it is also possible that this is not the case and that chiropractic medical students are intrinsically motivated by high levels of cognitive appraisals of value, as though following a "calling" as Kao and Jager (2018) described in their study of medical students. If these findings are reproduced, they may have implications for the process of selection and admission of students.

The findings of this study indicate a high degree of correlation of the educational environment with cognitive appraisals of control. As discussed in this paper, high levels of perceived control are found to be related to positive achievement emotions and high academic achievement. Therefore, chiropractic educators need to be aware of the importance of the educational environment, particularly the perception of learning, academic self-perception and perception of atmosphere (the three DREEM subscales that were most correlated with control). Interestingly the lowest level of correlation with control was the subscale of social self-perception, which also had the highest level of correlation, of the five subscales, with perceptions of value. This possible reciprocal relationship of control and value with the DREEM subscale of "Social Self-Perception" could have important implications regarding the importance of the personal and social lives of students.

This may also reflect the unique character of chiropractic medical students, with social self-perception being highly important, and possibly internalized (that is, less related to perceptions of control but more related to perceptions of value). Educators would want to be aware of the importance of a supportive social environment for these students, and as well, aware that the perception of value significantly dropped in the second-year students suggesting a deleterious effect of first year studies (perhaps the rigorous workload, which typically detracts from social activities). Dunham et al. (2017) also found that perceptions of the learning environment worsened during the first three years of a four-year medical program. This was attributed to issues related to work-life balance and social relationships. This may be related to what is happening with the chiropractic medical students from first year to second year (although the worsening only affected cognitive appraisals of value, with very little effect on perceptions of the educational environment). This has implications for educators who should try to create the environment, or circumstances, that promote high levels of both control and value.

7.4 Recommendations for further research

Future studies could be undertaken to (1) attempt to reproduce the current findings to validate them, in the same study population and in one or more other chiropractic colleges; (2) further investigate the nature and significance of perceived value among chiropractic medical students and other healthcare students; and (3) investigate the next element of Pekrun's Control-Value Theory by seeking evidence of the posited relationship between cognitive appraisals of control and value, and achievement emotions, in chiropractic students.

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Appendix 1 – Survey Instrument

Student survey related to educational environment and educational values

Current semester of study: ___ First Semester ___ Second Semester

Gender: ___ Female ___ Male

Age: ___ Under 25 ___ 26-30 ___ 31-35 ___36-40 ___ Over 40

Ethnicity: ___ Hispanic ___ African-American ___ Neither Hispanic nor African-American

Pre-chiropractic background: ___ BS/BA or higher ___ no degree or associate degree

Please respond to the following statements according to the options provided:

1. I am encouraged to participate in class

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

2. The teaching is sufficiently concerned to develop my confidence

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

3. The teaching encourages me to be an active learner

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

4. The teaching is well focused

Strongly disagree	Slightly Disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

5. The teaching is sufficiently concerned to develop my competence

Strongly disagree	Slightly Disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

6. I am clear about the learning objectives of the courses

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

7. The teaching is often stimulating

Strongly disagree	Slightly Disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

8. The teaching time is put to good use

Strongly disagree	Slightly Disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

9. The teaching is student centered

Strongly disagree	Slightly Disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

10. Long-term learning is emphasized over short term

Strongly disagree	Slightly Disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

11. The teaching is too teacher-centered

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

12. The teaching over-emphasizes factual learning

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

13. The teachers are good at providing feedback to students

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

14. The teachers have good communications skills

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

15. The teachers are knowledgeable

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

16. The teachers give clear examples

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

17. The teachers are well prepared for their classes

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

18. The teachers provide constructive criticism here

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

19. The teachers ridicule the students

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

20. The teachers get angry in class

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

21. The teachers are authoritarian

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

22. The teachers are patient

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

23. The students irritate the teachers

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

24. I am able to memorize all I need

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

25. Much of what I have to learn seems relevant to a career in chiropractic medicine

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

26. I feel I am being well prepared for my profession

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

27. Last semester's work has been a good preparation for this semester's work

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

28. My problem-solving skills are being well developed here

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

29. I am confident about passing this semester

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

30. I have learned a lot about empathy in my profession

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

31. Learning strategies which worked for me before continue to work for me now

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

32. The atmosphere is relaxed during lectures

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

33. I feel able to ask the questions I want

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

34. I feel comfortable in class socially

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

35. There are opportunities for me to develop interpersonal skills

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

36. The atmosphere is relaxed during lectures

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

37. The enjoyment outweighs the stress of studying chiropractic medicine

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

38. The atmosphere motivates me as a learner

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

39. I am able to concentrate well

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

40. The atmosphere is relaxed during seminars and labs

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

41. The school is well timetabled

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

42. I find the experience disappointing

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

43. Cheating is a problem in this school

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

44. I have good friends in this school

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

45. There is a good support system for students who get stressed

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

46. I am too tired to enjoy this program

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

47. I am rarely bored in this program

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

48. My accommodation is pleasant

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

49. My social life is good

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

50. I seldom feel lonely

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

51. I have a great deal of control over my academic performance in my courses

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

52. The more effort I put into my courses, the better I do in them

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

53. I see myself as largely responsible for my performance throughout my college career

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

54. When I do poorly in my courses, it is usually because I haven't given it my best effort

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

55. My grades are basically determined by things beyond my control and there is little I can do to change that

Strongly disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Strongly agree
1	2	3	4	5

56. How important is the process of learning to you?

Very important	Important	Neutral	Not important	Not at all important
1	2	3	4	5

57. I feel that, to me, doing well in my studies is…

Very important	Important	Neutral	Not important	Not at all important
1	2	3	4	5

58. How important is it for you to get good grades?

Very important	Important	Neutral	Not important	Not at all important
1	2	3	4	5

59. Compared to most of your other activities, how important is it for you to perform well academically?

Very important	Important	Neutral	Not important	Not at all important
1	2	3	4	5

60. How useful is doing well at school to your future career as a chiropractic physician?

Very important	Important	Neutral	Not important	Not at all important
1	2	3	4	5

Appendix 2 – Ethics Approval Letter from University of Liverpool

UNIVERSITY OF LIVERPOOL | ONLINE PROGRAMMES

Dear Michael Wiles

I am pleased to inform you that the EdD. Virtual Programme Research Ethics Committee (VPREC) has approved your application for ethical approval for your study. Details and conditions of the approval can be found below.

Sub-Committee:	EdD. Virtual Programme Research Ethics Committee (VPREC)
Review type:	Expedited
PI:	
School:	Lifelong Learning
Title:	Can factors in the educational environment influence control-value appraisals as precedents of positive achievement emotions? (Can the educational environment influence academic performance and achievement?)
First Reviewer:	Dr. Lucilla Crosta
Second Reviewer:	Dr. Marco Ferreira
Other members of the Committee	Dr. Josè Reis Jorge, Dr. Kathleen Kelm
Date of Approval:	02/08/2017

The application was APPROVED subject to the following conditions:

Conditions		
1	Mandatory	M: All serious adverse events must be reported to the VPREC within 24 hours of their occurrence, via the EdD Thesis Primary Supervisor.

UNIVERSITY OF LIVERPOOL | ONLINE PROGRAMMES

This approval applies for the duration of the research. If it is proposed to extend the duration of the study as specified in the application form, the Sub-Committee should be notified. If it is proposed to make an amendment to the research, you should notify the Sub-Committee by following the Notice of Amendment procedure outlined at http://www.liv.ac.uk/media/livacuk/researchethics/notice%20of%20amendment.doc.

Where your research includes elements that are not conducted in the UK, approval to proceed is further conditional upon a thorough risk assessment of the site and local permission to carry out the research, including, where such a body exists, local research ethics committee approval. No documentation of local permission is required (a) if the researcher will simply be asking organizations to distribute research invitations on the researcher's behalf, or (b) if the researcher is using only public means to identify/contact participants. When medical, educational, or business records are analysed or used to identify potential research participants, the site needs to explicitly approve access to data for research purposes (even if the researcher normally has access to that data to perform his or her job).

Please note that the approval to proceed depends also on research proposal approval.

Kind regards,

Lucilla Crosta

Chair, EdD. VPREC

Appendix 3 – Ethics Approval Letter from [redacted] University

Document Approved On: 6/27/18
Project Expiration On: 6/26/19
Protocol Number: IRB000OC17MW60

[redacted] University
Internal Studies
Institutional Review Board
Approval Form

Researcher Name(s): **Michael Wiles**	
Campus where research will be conducted: **West Palm Beach**	
Name of individual who granted permission to collect or access data (letter stating approval must be attached): **Campus President Kim Lea**	
Title of Study: **Can factors in the educational environment influence control-value appraisals as precedents of positive achievement emotions?**	

☑	**Level of Study** **(Describe reason for selected review)**	
☐	Exempt	
☒	Expedited	**Minimal risk to human participants**
☐	Full Review	

Abstract
(Insert abstract here)

That the educational environment is capable of influencing educational outcomes appears rather intuitive. Pekrun (1992) put forward a theoretical framework linking the educational environment to cognitive appraisals of control (of the learning

2017

process) and value (placed on learning), which in turn were posited to influence "achievement emotions" (emotions relevant to learning), with these emotions directly influencing academic performance or outcomes. Using this theoretical framework, the proposed mixed methods research aims at exploring the relationship between factors in the educational environment and cognitive appraisals of control and value, as precedents of achievement emotions and educational outcomes. First year chiropractic medical students will be surveyed for their perceptions of the educational environment using the Dundee Ready Educational Environment Measure as well as 10 questions that focus on the participants' perceptions of the value they place on their education and the degree of control they perceive they possess over it. These data will be subjected to regression analysis and triangulated with qualitative data from interviews with 6 volunteer subjects from the sample population.

Applicants do not write below this line. This area is for IRB use only.

[redacted] IRB Recommendation

☑ Recommend for approval ☐ Recommend with modifications ☐ Denied Approval

Notes.

Shoshana Dayanim, PhD Digitally signed by Shoshana Dayanim, PhD DN: cn=Shoshana Dayanim, PhD, o=Keiser University, ou=Graduate Psychology, email=sdayanim@keiseruniversity.edu, c=US Date: 2018.06.26 08:53:30 -04'00'

IRB Representative Signature Date Signed

Vice Chancellor of Academic Affairs

☒ Approve ☐ Modifications Needed ☐ Deny

Notes.

06/25/18

Vice Chancellor of Academic Affairs Signature Date Signed

2017

Document Approved On: 6/27/18
Project Expiration On: 6/26/19
Protocol Number: IRB000OC17MW60

[redacted] UNIVERSITY

KU

2085 Vista Parkway
West Palm Beach, FL 33411
Telephone: 561 471-6000
Fax: 561 471-7849

To Whom It May Concern:

Re: Dr. Michael Wiles Research Project

Pending approval of the Keiser University Institutional Review Board, I grant permission for Dr. Wiles to pursue his thesis research including access to data and to participants; facility use; and the use of personnel time for research purposes.

Kimberly Lea, EdS
Campus President

Appendix 4 – Participant Information Sheet

Participant Information Sheet – Survey and Interview Research

Research Purpose

This research is in partial fulfilment of the requirements for the Doctor of Education degree. It seeks to explore the relationship between the educational environment and other factors that influence academic performance or achievement. These other factors include the degree to which students feel they have control over their education, and the degree to which students value their education. This research project seeks to identify ways in which the educational program and student experience can be improved at the College of Chiropractic Medicine at [redacted] University and thus for other similar programs of education at other institutions.

Invitation to Participate

This research will be based on the perceptions, views and attitudes of chiropractic medical students at [redacted]University, and therefore, all currently enrolled chiropractic medical students are invited to participate. Participation will consist of the completion of a 60-item questionnaire which will be accessible via a link to Survey Monkey. Once consent is given for the survey, then participants will gain access to the questions. The survey should take about 30 minutes to complete. Also, at the end of the online survey, participants will be invited to agree to participate in an interview, and interview subjects will be selected from the list of students who volunteer to be interviewed. The interview should take about 30 minutes to complete, and will be audio-recorded only with the permission of the participant. Questions will be asked about the participants' perspectives and views on their educational environment, and their perception of control over their educational process, and the value that they place on their education. Upon completion of the survey questions, and hitting the submit button, participants' survey data will not be retrievable. Their interview data however can be retrieved and withdrawn up until the time that the thesis has been completed. There is no reimbursement for participation, and participation is entirely voluntary. Those volunteering to participate are free to withdraw from participation at any time during the data collection process. There are no consequences to withdrawal from participation.

Benefits to Participation

Participants could benefit by becoming more aware of the ways in which the educational environment might influence their learning process. Also, current or future students may benefit if the research recommendations lead to structural and/or pedagogical enhancements to the educational program.

Data Collection Procedures

For this research study, the researcher will collect survey data to be analysed quantitatively, and interview data to be analysed qualitatively using thematic analysis.

Ethical Concerns

- **Permission Granted**
  Researchers are required to complete an ethical approval process prior to scheduling the interview and collecting organisational documents. They are to be granted permission through an authorization letter from the organisation (from a confirmable source) granting permission for all relevant data access, facility use, and use of personnel time for research purposes.

- **Potential Conflicts Of Interest**
  In order to avoid ethical complications, the researcher will make it clear that participation in this project is entirely voluntary. In addition, the researcher will obtain approval from the university's Institutional Review Board prior to commencing the project. The researcher's role in this project is separate and unrelated to his professional role at [redacted] University.

- **Confidentiality**
  In all cases, collected information will be anonymised, no proprietary information will be shared, and the privacy of the interviewees will be safeguarded. Data will be stored for at least 5 years with adequate provisions to maintain confidentiality, which will include storage on a password protected cloud-based drive on a university computer, The university-based storage drive and locked cabinet will be accessible solely by the researcher. If the research procedures might reveal criminal or unethical activity that necessitates a duty to report, then the researcher will follow appropriate ethical procedures in keeping with the organisation's regulations.

- **Risks**
  There are minimal risks associated with participation in this research. The survey data will be collected anonymously. The interviewees will be by necessity known to the researcher, but the reporting of interview data will not contain any identifiable information, and the interview data will only refer to participants by code, such as "participant 1". At the participants' discretion, the interviews will be conducted either in a private conference room in the graduate studies office or another private location at the university where the participants' identify will not be disclosed. Participants who experience distress because of unexpected outcomes or adverse events will be offered assistance by referral to the office of Student Services for counselling.

Contact Details

- **My contact details are:**
  Dr. Michael Wiles michael.wiles@online.liverpool.ac.uk 561-471-6000
- **My supervisor, Dr. Martin Gough, can be reached at:**
  m.gough@liverpool.ac.uk
- **The Research Participant Advocate at the University of Liverpool can be reached at**:
  liverpoolethics@ohecampus.com

Please keep/print a copy of the Participant Information Sheet for your reference. Please contact me and/or my supervisor and/or the Research Participant Advocate at the University of Liverpool with any question or concerns you may have.

Michael Wiles	July 1, 2017	
Researcher	Date	Signature

Appendix 5– Consent Form

[redacted] University

Institutional Review Board

Informed Consent Form

Researcher:	**Michael Wiles, DC**
Title of Study:	**Can factors in the educational environment influence control-value appraisals as precedents of positive achievement emotions?**

Degree Program	
Type of Degree	**Field of Study**
EdD (University of Liverpool)	**Higher Education**

Dissertation Chair/Research Mentor: **Dr. Martin Gough**

email: m.gough@liverpool.ac.uk

IRB Certification

I understand that this research study has been reviewed and certified by the Institutional Review Board at [redacted]. For research-related problems, or questions regarding participants' rights, I can contact the Institutional Review Board through the IRB Chair at (954) 318-1620.

Invitation to Participate and Description of the Project

Description of study

This research is in partial fulfilment of the requirements for the Doctor of Education degree. It seeks to explore the relationship between the educational environment and other factors that influence academic performance or achievement. These other factors include the degree to which students feel they have control over their education, and the degree to which students value their education. This research project seeks to identify ways in which the educational program and student experience can be improved at the College of Chiropractic Medicine at [redacted] University and thus for other similar programs of education at other institutions.

Participants Role in the Study

This research will be based on the perceptions, views and attitudes of chiropractic medical students at [redacted] University, and therefore, all currently enrolled chiropractic medical students are invited to participate. Participation will consist of the completion of a 60-item questionnaire which will be accessible via a link to Survey Monkey. Once consent is given for the survey, then participants will gain access to the questions. The survey should take about 30 minutes to complete. Also, at the end of the online survey, participants will be invited to agree to participate in an interview, and interview subjects will be selected from the list of students who volunteer to be interviewed. The interview should take about 30 minutes to complete, and will be audio-recorded only with the permission of the participant. Questions will be asked about the participants' perspectives and views on their educational environment, and their perception of control over their educational process, and the value that they place on their education. Upon completion of the survey questions, and hitting the submit button, participants' survey data will not be retrievable. Their interview data however can be retrieved and withdrawn up until the time that the thesis has been completed. There is no reimbursement for participation, and participation is entirely voluntary. Those volunteering to participate are free to withdraw from participation at any time during the data collection process. There are no consequences to withdrawal from participation.

Risks and Inconveniences

There are minimal risks associated with participation in this research. The survey data will be collected anonymously. The interviewees will be by necessity known to the researcher, but the reporting of interview data will not contain any identifiable information, and the interview data will only refer to participants by code, such as "participant 1". At the participant's discretion, the interview will be conducted either in a private conference room in the graduate studies office or another private location at the university where the participant's identify will not be disclosed. Participants who experience distress because of unexpected outcomes or adverse events will be offered assistance by referral to the office of Student Services for counselling.

Benefits

Participants could benefit by becoming more aware of the ways in which the educational environment might influence their learning process. Also, current or future students may benefit if the research recommendations lead to structural and/or pedagogical enhancements to the educational program.

Financial (or other) Considerations

There are no financial or other considerations for participation in this study.

Confidentiality

In all cases, collected information will be anonymised, no proprietary information will be shared, and the privacy of the interviewees will be safeguarded. Data will be stored for at least 5 years with adequate provisions to maintain confidentiality, which will include storage on a password protected cloud-based drive on a university computer. The university-based

storage drive will be accessible solely by the researcher. If the research procedures might reveal criminal or unethical activity that necessitates a duty to report, then the researcher will follow appropriate ethical procedures in keeping with the organisation's regulations.

Voluntary Participation

Your participation in this study is entirely voluntary. You may refuse to participate in this research. Such refusal will not have any negative consequences for you. If you begin to participate in the research, you may at any time, for any reason, discontinue your participation without any negative consequences

Other considerations and Questions

Please feel free to ask any questions about anything that seems unclear to you and to consider this research and consent form carefully before you sign.

Authorization

I understand the explanation provided to me. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study. I have been given a copy of this consent form. If I do not participate, there will be no penalty or loss of rights. I can stop participating at any time, even after I have started.

I agree to participate in the study. My consent to participate is confirmed by clicking "yes" on question #1 on the online survey, which asks if I consent to answer the questions in the survey and participate in this research project.

APPENDIX 6 – List of courses comprising the chiropractic educational program

Semester	Courses	Lecture hr./wk.	Lab/clinic hr./wk.	Credits	Total hours
1	DCP711 Molecules and cells	2	0	2	30
	DCP712 Biochemistry 1	2	2	3	60
	DCP713 Physiology 1	2	2	3	60
	DCP721 Gross and Spinal Anatomy 1	5	6	8	165
	DCP761 Chiropractic Therapeutics 1	1	4	3	75
	DCP762 Principles of Chiropractic Practice 1	1	0	1	15
	DCP771 Clinical and Professional Development 1	1	0	1	15
	DCP772 Clinical case conference	0	2	1	30
	SEMESTER 1 TOTAL	**14**	**16**	**22**	**450**
2	DCP714 Biochemistry 2	2	2	3	60
	DCP715 Physiology 2	2	2	3	60
	DCP722 Histology	1	2	2	45
	DCP723 Gross and Spinal Anatomy 2	3	4	5	105
	DCP763 Chiropractic Therapeutics 2	2	6	5	120
	DCP764 Principles of Chiropractic Practice 2	1	0	1	15
	DCP773 Clinical and Professional Development 2	2	0	2	30
	DCP774 Grand Rounds	0	2	1	30
	SEMESTER 2 TOTAL	**13**	**18**	**22**	**465**
3	DCP724 Gross Anatomy 3 and Embryology	4	4	6	120
	DCP731 Neuroscience	4	4	6	120
	DCP732 Pathology 1	3	0	3	45
	DCP765 Chiropractic Therapeutics 3	2	6	5	120
	DCP766 Principles of Chiropractic Practice 3	1	0	1	15
	DCP775 Clinical and Professional Development 3	1	0	1	15
	DCP776 Grand Rounds	0	2	1	30
	SEMESTER 3 TOTAL	**15**	**16**	**23**	**465**
4	DCP831 Pathology 2	3	0	3	45
	DCP832 Clinical Microbiology and Immunology	4	0	4	60
	DCP841 Diagnostic and Clinical Sciences 1 – Examination	3	4	5	105
	DCP861 Chiropractic Therapeutics 4	2	6	5	120
	DCP862 Principles of Chiropractic Practice 4	1	0	1	15
	DCP863 Chiropractic Therapeutics 5 – Clinical Nutrition	2	2	3	60
	DCP871 Clinical and Professional Development 4	2	0	2	30
	DCP872 Grand Rounds	0	2	1	30
	SEMESTER 4 TOTAL	**17**	**14**	**24**	**465**
5	DCP842 Diagnostic and Clinical Sciences 2 – Introduction to Orthopedics	2	2	3	60
	DCP843 Diagnostic and Clinical Sciences 3 – Clinical Laboratory Diagnosis	2	2	3	60
	DCP851 Diagnostic Imaging 1 - Technique	2	2	3	60
	DCP864 Chiropractic Therapeutics 6	2	6	5	120

	DCP865 Chiropractic Therapeutics 7 – Physiological Therapeutics	2	2	3	60
	DCP873 Clinical and Professional Development 5	2	0	2	30
	DCP874 Clinical Practice 1	2	4	4	90
	DCP875 Grand Rounds	0	2	1	30
	SEMESTER 5 TOTAL	**14**	**20**	**24**	**510**
6	DCP844 Diagnostic and Clinical Sciences 4 - Orthopedics	2	2	3	60
	DCP845 Diagnostic and Clinical Sciences 5 – Clinical Laboratory Seminar	0	2	1	30
	DCP846 Diagnostic and Clinical Sciences 6 – Neurology	3	0	3	45
	DCP852 Diagnostic Imaging 2 - Technique	1	2	2	45
	DCP866 Chiropractic Therapeutics 8	2	4	4	90
	DCP867 Chiropractic Therapeutics 9 - Rehabilitation	1	2	3	45
	DCP876 Clinical and Professional Development 6	2	0	2	30
	DCP877 Clinical Practice 2	2	4	4	90
	DCP878 Grand Rounds	0	2	1	30
	SEMESTER 6 TOTAL	**13**	**18**	**23**	**465**
7	DCP941 Diagnostic and Clinical Sciences 7 – Orthopedics	2	2	3	60
	DCP942 Diagnostic and Clinical Sciences 8 – Systems Disorders	5	0	5	75
	DCP943Diagnostic and Clinical Sciences 9 – Emergency Care	1	0	1	15
	DCP944 Diagnostic and Clinical Sciences 10 – Women's Health and Chiropractic Pediatrics	3	0	3	45
	DCP945 Diagnostic and Clinical Sciences 11 - Pharmacology	1	0	1	15
	DCP951 Diagnostic Imaging 3 - Technique and interpretation	2	2	3	60
	DCP971 Clinical and Professional Development 7	1	0	1	15
	DCP972 Clinical Practice 3 – Pre-Clerkship	2	6	5	120
	DCP973 Grand Rounds	0	2	1	30
	SEMESTER 7 TOTAL	**17**	**12**	**23**	**435**
8	DCP946 Diagnostic and Clinical Sciences 12 – Systems Disorders	5	0	5	75
	DCP947 Diagnostic and Clinical Sciences 13 – Chiropractic Geriatrics	3	0	3	45
	DCP952 Diagnostic Imaging 4 - Interpretation	2	2	3	60
	DCP962 Chiropractic Therapeutics 10 – Nutritional Therapy Seminar	0	2	1	30
	DCP974 Clinical and Professional Development 8	2	0	2	30
	DCP975 Clinical Practice 4 - Clerkship	2	8	6	150
	DCP976 Grand Rounds	0	2	1	30
	SEMESTER 8 TOTAL	**14**	**14**	**21**	**420**
9	DCP948 Diagnostic and Clinical Sciences 14 – Public Health	2	0	2	30
	DCP949 Diagnostic and Clinical Sciences 15 – Topics in Contemporary Healthcare	2	0	2	30
	DCP953 Diagnostic Imaging 5 – Interpretation	0	2	1	30
	DCP963 Chiropractic Therapeutics 11	0	2	1	30

	DCP964 Principles of Chiropractic Practice 5 DCP977 Clinical and Professional Development 9 DCP978 Clinical Practice 5 - Clerkship DCP979 Grand Rounds	1 1 2 0	0 0 16 2	1 1 10 1	15 15 270 30
	SEMESTER 9 TOTAL	**8**	**22**	**19**	**450**
10	DCP 990 Clinical Practice 6 - Externship and/or preceptorship	0	30	15	450
	SEMESTER 10 TOTAL	**0**	**30**	**15**	**450**
TOTAL				**216**	**4575**